L 4



L 4

Presented by

22400043390

1899

Med
K46085


Digitized by the Internet Archive
in 2016

https://archive.org/details/b28114139

OVER-PRESSURE.

Cheap Edition, Crown 8vo, Boards, Price 1s.

The
FOUNDATIONS OF SUCCESS.

A PLEA FOR RATIONAL EDUCATION.

BY

STANLEY DE BRATH, M. Inst. C.E.

THE TIMES.

"Mr. S. De Brath, the author of this vigorous and stimulating little volume, is of opinion, which is probably shared by most people who have given serious attention to the subject, that the system of secondary education at present in vogue in this country is very imperfectly adapted to the real conditions of modern civilization, and to the highest needs of modern culture. Measuring 'success' by no sordid or material standard, but by the fitness of the citizen to discharge the duties—personal, industrial, and social—of citizenship, he starts from the assumption that the foundations of success of this kind are to be sought in a system of 'rational education.'"

LONDON: GEORGE PHILIP & SON, 32 FLEET STREET, E.C.
LIVERPOOL: PHILIP, SON & NEPHEW, 45—51 SOUTH CASTLE STREET.

OVER-PRESSURE.

BY

S. DE BRATH AND F. BEATTY,

Of Grande Rocque School, Guernsey.



LONDON:

GEORGE PHILIP & SON, 32 FLEET STREET.

LIVERPOOL: PHILIP, SON & NEPHEW, 45-51 SOUTH CASTLE STREET.

1899.

[*All Rights Reserved.*]

31818/91

WELLCOME INSTITUTE LIBRARY
Coll. welMOmec
Call No. WS

PREFACE.

THE Board of Education Bill, which has just received the Royal Assent, introduces a new means of unifying the spirit and harmonizing the methods of English Secondary Schools. Not only the lever of the public examinations, but a new and powerful machine now exists to bring order into our chaotic instruction, while leaving untouched the educative discipline of free-born Englishmen, of which our public schools are the living type.

The position contemplated by the authors in the final chapter of this little book is, therefore, somewhat modified, in the sense that fresh means have been created for giving effect to those principles of Natural Law which must govern all truly successful practice.

The adoption of methods slowly worked out on the psychological principles of Comenius, Rousseau, Pestalozzi, Froebel, Herbart, Herbert Spencer, and others, is now within sight, and will, we may hope, definitely relieve the Over-pressure which is still such a burden on the rising generation.

Signs are not wanting that these principles will shortly receive wide practical recognition. After this little book had passed out of their hands, the authors saw for the first time Miss Catherine Dodd's "Introduction to the Herbartian Principles of Teaching." It is surely a hopeful sign that, in at least some Primary Schools, an attempt is being made to select historical material with due regard to the Herbartian "culture epochs."

Preface.

The frank recognition of the high cultural value of History teaching, however much it may need modification for Secondary Schools both as to the material chosen and the sequence of its presentment, cannot but be heartily welcomed by all who believe that the truly valuable, enlightening, and humanizing part of instruction is that which arouses the interests, fires the heart, and awakens conscious kinship with those who have left us our great World-heritage to develop and improve.

Guernsey, August, 1899.

TABLE OF CONTENTS.

		PAGE
Introduction.		v.
Chapter I.	The Nervous System . .	1
Chapter II.	Nervous Energy . . .	25
Chapter III.	Mental Economics . . .	47
Chapter IV.	Science Teaching: What and How?	70
Chapter V.	History Teaching . . .	102
Chapter VI.	A High Standard . . .	131
Chapter VII.	Without Overstrain . .	175
Chapter VIII.	The Great Examination Question	205

"Secondary and higher education is not, like popular education, a subject which very keenly interests at present our educated and intelligent classes. It is their own education: and with their own education they are, it seems, tolerably well satisfied. Yet I hope that here again these classes—above all I hope that the great Middle class, which has much the widest and the gravest interests concerned in the matter—will not refuse their attention to the experience afforded by the Continent. If the training of our working class, as compared with the working classes elsewhere, inspires apprehension, has the training of their employers, as compared with employers elsewhere, no matter of apprehension for us? There are people who say that the labour questions which embarrass us owe their gravity and danger at least as much to the inadequacy of our middle class for dealing with such questions, as to the inadequacy of our working class. The study of Continental education will show our educated and intelligent classes that many things which they wish for cannot be done as isolated operations, but must, if they are to be done at all, come in as parts of a regularly designed whole."

MATTHEW ARNOLD,

Higher Schools and Universities in Germany—Preface.

"The amount of mental energy which is imperatively demanded if we wish to reach even a moderate point of excellence; the extreme pressure which competitive examinations have thrown upon the brains of the young men of the present day, at the very time when such large demands are being made upon their nervous constitutions for the completion of their physical growth, cannot fail to affect disastrously their future nervous vigour."

DR. WALTER TYRRELL, M.R.C.S., and

DR. GUY TYRRELL, L.R.C.P., M.R.C.S.

Nervous Exhaustion—p. 9.

INTRODUCTION.

"The education of children is absolutely compulsory from the age of six to fourteen. If parents, no matter what their social rank may be, neglect to have their children taught during the age from six to fourteen by a qualified teacher, they are compelled to send them to the public elementary school."—*Extract from Consular Report, Düsseldorf, Journal Society of Arts, July 1893.*

A comparison of the above with the quotations which face these lines will explain the present work.

In countries where education is studied and believed in, it is clearly seen that the years from six to fourteen are the really important ones in the mental history of the normal child. In England the compulsion of facts has indeed determined that these years shall be used to the full in the Board Schools, but that our wealthy upper middle classes are not aware of their great importance is abundantly proved by the indifference with which they regard the education of their children during this time, and by the fact that numbers of sons and daughters of professional and commercial men are markedly inferior in attainment to a not inconsiderable percentage of children of the same age in the best municipal schools, a percentage small perhaps severally, but forming a large and growing aggregate.

This indifference may partly arise from experience that, owing to the methods and subject matter of instruction being nearly the same in the younger as in the older classes, school instruction tries young brains without adequate results; but it is broadly true that unless parents see a chance of winning a scholarship in a public school (in which case the promising boy may be forced and crammed, to the great detriment of his real progress), they are quite indifferent to what he learns, and console themselves for growing habits of carelessness and idleness with the trite fallacy that "Boys do not begin to work till fourteen."

But it is clear that the highest success must attend that growth which finds at each stage its appropriate treatment, and the fact that these years are not utilized, accounts for many failures as well as for many break-downs in later efforts, made under the spur of severe competition, to redeem lost time. After the twelfth year it is quite usual for parents to be alive to the growing need; indeed, in face of the keen competition which exists, it is scarcely possible for any to ignore it, except those spoiled children of Fortune who make their riches a peril instead of a power; but up to that time instruction is not taken seriously at all, chiefly because our whole theory and practice is bookish.

A previous little book* endeavoured to show that the foundation of all permanent national and individual success is ability produced by the right direction of mental power: in this, a valued colleague has helped me in the endeavour to show how this training may be carried out (as far as instruction only is concerned, and leaving matters of discipline and guidance), and how this neglected period from six to twelve years of age may be utilized alike without check, without strain, and without cramming tricks.

For those who must reach a high intellectual standard, this use of the early years, concurrently with the establishment of sound physical habits, is the solution of the difficulty.

Study of the problem has convinced us that neither excessive athletics nor undue devotion to the classical languages are the chief defects in English schools, though less time might with advantage be given to talking about games as compared with playing them, and more time might be devoted to ideas (whether scientific or literary), and less to mere language. But teaching specially adapted to the age from 8 to 12, and the consequent economy of time and power, is sorely needed, and the lack of it is the really weak place in the English school system.

Not long since, in one of the regularly recurring letters on public school reform in the newspaper press, it was suggested, apparently in all seriousness, that this reform might be initiated by piecing the venerable fabric of Etonian tradition with the best modern cloth—transferring the staff of a celebrated Army

* *Foundations of Success.* Philip & Son. 1897.

"Crammer" to its sacred precincts. The precise method of the transfer was not indicated, the contention seemingly being that the "Crammer" teaches well, and that the public school staff does not.

Passing by the more than questionable assumption and the less than questionable infeasibility of the graft, the observation is remarkable as showing how wide is the misapprehension of the problem before us.

The healthy, breezy social life, the wholesome republicanism, the rational liberty and self-government prevailing in our public schools, which makes them the envy of foreign nations far ahead of us in the matter of instruction, need no praise, and it is part of our contention that the instruction of the senior forms leaves but little to be desired. These features are imitated with varying success, according to the breadth and character of the head-master, in hundreds of private schools. But in very few of these is it recognised that to set children of eight down to a book at all, or to start with Grammar definitions and axioms, is little less than sheer waste of time. On the contrary, they are set to learn and repeat tasks the words of which they do not understand, and which they can only retain by their memories, an effort so great that its fulfilment is not seriously expected.

Then when the precious years from 8 to 14 have been lost, the tutor, whether a member of a school staff or an army coach, is set to furnish with abstract ideas minds which should have a number of concrete experiences and definite instances, which the abstract ideas to be taught would fit and unify, but in the absence of these, such abstract ideas are merely formulæ or statements to be remembered, often only until the examination has been passed.

A word or two on our Syllabus may be of interest. The curriculum which resulted from an endeavour to balance the theoretical claims of literary, linguistic, and exact studies in a modern liberal education, was found on completion to agree so nearly with that permitted by the Civil Service Commissioners for the Military and Naval Examinations as a test of modern liberal education, that only a few slight modifications, not involving any departure from the principle, were required to bring the former into line with the latter. The curriculum given

in Chapter VII. is the result of these modifications, a somewhat remarkable fact, upon which more will be said in connection with "The Great Examination Question."

The only modifications which we should prefer, did the normal educational conditions admit of it, would be to drop Latin altogether on the "modern side," and replace it by thorough familiarity with English history and literature, and a thorough training in elocution, composition, and précis writing—giving, in fact, the "Humanities," as the Greeks gave them, in the Mother Tongue.

S. DE BRATH,
M. Inst. C.E.

Grande Rocque, Guernsey,
January, 1899.

OVER-PRESSURE IN EDUCATION.

Chapter I.

THE NERVOUS SYSTEM.

"Overstrain is the exhaustion of the nervous system from whatever cause. Applied to Education, it means exhaustion by over-demands on the brain."

"More and more, if it is to be truly successful, must education be based on our knowledge of cerebral function, and be moulded by the discoveries of experimental psychology. As yet it contemptuously ignores these. It often thwarts instead of guiding brain growth, checking by its interference the spontaneous process of natural evolution."—*Sir James Crichton Browne, M.D.*

1. Nervous Overstrain. Of all the progress whereon our century is wont to plume itself, none is more prominently put forward than our improvements in sanitary methods. The discoveries of bacteriologists are applied almost as soon as made, and food, water, drainage, soil, and the conditions of physical life generally, are watched over by the legislature and considered by the individual with more attention than ever before.

But, while the corresponding decrease of zymotic disease has been most striking, this has been accompanied by an even greater increase in those ailments which are pre-eminently termed "nervous", and there is a body of evidence which points to the conclusion that these increasing ailments show varieties sufficiently pronounced to be

made the basis of charges of degeneracy. Even Professor Max Nordau's hyperboles cannot invalidate the drift of the evidence he brings forward. We reprobate the jovial ways of our grandfathers, who not only lived to a good old age but continued hale and hearty till late in life although they permitted themselves a freedom which we are unable to bear; and some of us even drag in hearsay biology, and charge upon heredity not only our nervous instability, but even the transmission of ailments from which our forbears did not suffer. But as they were not victims to nervous exhaustion, it is at least open to question whether they transmitted it, and whether, in fact, the pleasant theory is true that the heredity which was made for us, rather than the environment which we make for ourselves, is to blame for diminished vigour. For diminished vigour there certainly is. The jaded condition of large numbers of professional and business men, the constant need for rest and change of air and scene, are too common to need proof, and this is accompanied by a distinct diminution in massiveness. When, a short time since, the bones of some of those who fell at Waterloo were moved to a new resting-place, it was noted that nearly all were skeletons of men six feet high. The superiority of British to continental physique has now practically disappeared; and not only has the height and chest measurement of our recruits steadily fallen, but the general smallness of men and women in our towns is patent to any observer who remembers that a healthy Englishman should stand 5 ft. 10 in., weigh 12 stone, and measure 40 inches round the chest.

That the pressure should be complained of among ill-fed Board School children is no matter for surprise; but among our educated classes also it is a common complaint that sons and daughters have not the physique of their parents, that they suffer from neuralgia or anæmia, and need frequent medical advice. And this falling off is general

among classes whose nourishment leaves nothing to be desired, and among quite young men. At the Conference held at Rugby in December, 1896, the head-master of one of our greatest public schools said that "the medical officer at Woolwich had stated that a considerable number of the cadets were not of good physique, were intellectually overworked, and were of anæmic appearance"; a statement which fully bears out that of another schoolmaster in charge of an Army class,—that the preparation is for "Woolwich or Hanwell"! Pale undersized boys and girls abound, wrinkled foreheads, headaches, constant "colds," tonsilar growths, nervous twitches, unsymmetrical development, and breakdowns in preparing for examinations, are so frequent that they have lost their importance to the many who notice only the abnormal. Early decay of teeth is rather the rule than the exception, while medical testimony is abundant and singularly unanimous to the increase of impaired eyesight in children.

Nor is the importance of these facts lessened because every large school has a number of boys who distinguish themselves in the cricket and football field, and whose fine development is constantly appealed to as a standing proof that all is well in the best of all possible schools in the leading country of the world. For along with these there is also a number—sometimes a very considerable number—of boys who take little share in the games except to stand about as onlookers at those contests wherein the honour of the school is upheld by picked teams of athletes. I know more than one public school where every boy must join in the games or show a medical certificate; but I know also at least one very large public school where the masters are satisfied if a good crowd of boys assemble to "show interest" in the form matches.

The *Times* recently (Oct. 24th, 1898) published the result of a medical inspection of the boys entered at a great public school. "Of the first hundred boys examined,

thirty-nine were below the average height, and fifty-three below the average weight. Sixty-eight were below the average in chest measurement, sixty-three were the subject of 'deformities,' such as lateral curvature of the spine, pigeon-breast, knock-knee, and flat foot. Twenty had defective sight, nine defective hearing, one an abnormal growth, one was colour-blind, two had heart disease, two were ruptured, fourteen had varicocele, and twenty-two suffered from albuminuria."

Epsom School reports (the *Times*, Nov. 12, 1898) 35 per cent. below height, 49 per cent. below weight, and 43 per cent. below normal chest measurement. More of these much-needed statistics will probably come before the public.

So grave is the evil that special studies have been undertaken by medical men to determine the signs of nerve strain in children, and medical opinion now confirms the conclusions emphasized in 1877 by Herbert Spencer, that though increased attention to the facts may account for some of the apparent increase, much of the mischief is due to bad methods of teaching, and to the system of cramming for examinations; which latter, perhaps from deference to the general attitude of schoolmasters in face of the problem, is usually taken for one of the inevitable evils of civilised life.

But are these conditions unalterable? Is it the fact that modern life is necessarily productive of nerve strain and all its attendant evils, which are therefore unavoidably forced upon us; and that the tests which guard the professions from dangerous ignorance, and from superficial knowledge more dangerous still, are unduly severe and involve unhealthy over-exertion to the average boy? Or is it not rather that much of the "worry" and "rush" is due—apart from our forgetfulness of the lesson "not to be anxious for the morrow"—to want of method, to feverish endeavour to catch up lost time, to the need for acquiring knowledge at the very time that our duties call for its

exercise; want of system in training causing that greater haste which is the proverbial synonym for less speed?

Would not methodical work from the early years enable the average boy of the professional classes to reach his (by no means excessively high) standard without cram or overstrain, and thus fulfil that law of steady, natural, quiet growth, which is the first lesson to be learned of those lilies of the field which we are enjoined to consider? For the answer we must go to the exact seat of the trouble, and use all the information with which a singularly able body of specialists has presented us. Laws of growth are not less binding because in man they enter into the field of consciousness, and the modern world is so complex that only by the concurrence of many special forms of knowledge can true progress be made in any one. It is for the teacher who would guide himself to the best practice of his own profession, to understand, as far as may be, the processes with which he has to deal; to know the results, to enter into the labours, and to use the conquests of the physiologist.

These results tend more and more to show the nervous force as the proximate cause of all bodily change and development, including those phenomena of thought and emotion which are the special subject-matter of psychology.

It is to the increased supply of this nervous force that attention should be directed in the case of children in whom a small power of resistance to the effects of slight chills, over-exertion, or other disturbing causes shows its deficiency, rather than to the removal of these external causes, which are but the occasion for ailments.

It is in the habitual economy of this force, by wise habits of life, that the best and highest development of the organism is to be looked for, and by such economy and judicious use alone can a high standard be reached without overstrain.

This nervous force is the power on whose right direction depends, first, the physical and mental symmetry of the

organism, and afterwards those healthy reactions in contact with the manifold experiences of life which are called skill, knowledge, and directive ability; and before we can undertake to direct this nervous force at the present time, when failures are so common, it is essential that accurate knowledge should supplement the personal experience which must ever be the chief factor in successful teaching.

2. Innervation. The examination of an egg which has been incubated two or three days, will show in the yolk a few crawling veins of bright red colour and a small groove of membrane. The veins speedily become a branching net, and the open groove gradually changes to a closed cylinder (the future cerebro-spinal canal) by its margins growing up and meeting above it; and thenceforward it becomes the axis round which the hidden creative power develops the body which is to be. Not the bony framework, nor the circulatory system first appears, but blood and nerve, the substance of the organism and the instrument of the force which moulds it. The first manifestation of life is a central nerve, which is the instrument of all further growth and remains always the centre of activity.

In the human subject this central seat of life (the cerebro-spinal axis) is protected in a way which seems to emphasize its importance. Lying in the skull, and in the middle of the vertebræ, it is almost entirely surrounded by bone. From the brain, consisting of two convoluted hemispheres of white and grey nerve stuff, descends through a tube formed by the vertebræ, a cord of the same substance, about as thick as the little finger, consisting of many cylindrical nerve-trunks. From the central cord spring (Fig. 1) bundles (fascicles) of nerves in thirty pairs, which arise each from two roots at the same level in the spinal column, one root being in the front and the other at the back of the cord, hence described

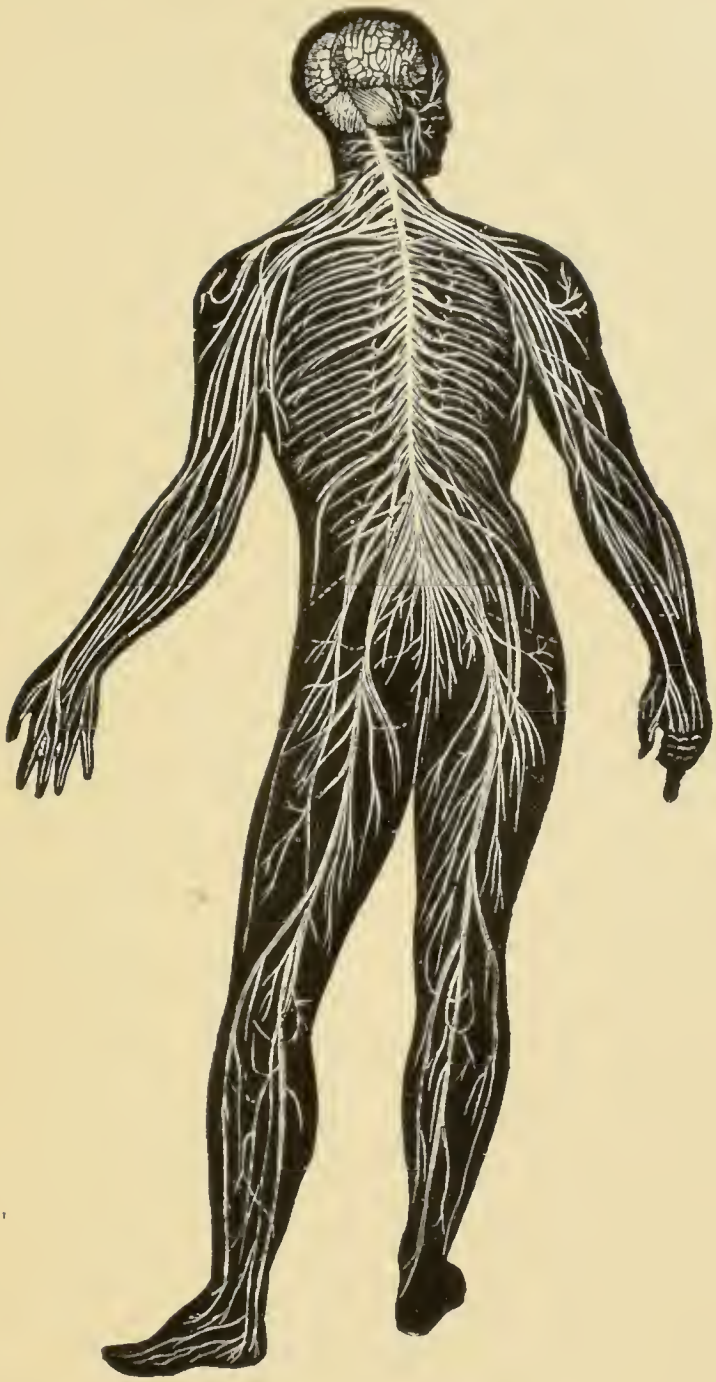


Fig. 1.

CEREBRO-SPINAL SYSTEM

After John Cleland, M.D. F.R.S.

as anterior and posterior roots, each pair being bound into one nerve-trunk by a white fibrous sheath. These fascicles, which are about the thickness of stout string, are constructed on the same model as the central cord, and are interlaced in groups (plexuses), the first four of the neck forming the cervical group; the last four and the greater part of the first dorsal joining to make the brachial group for the supply of the upper limbs; and the lumbar and four upper sacral nerves forming the groups principally distributed to the lower limbs. Besides being thus intimately connected into groups, the nerve fibres are at certain places gathered into knots (ganglia), some of whose functions will appear later. There are also several pairs of cranial nerves which take their rise at the top of the spinal column, and ramify to and from the different parts of the head and to the organs contained in it. The whole of the body is therefore in close communication with the brain, either directly or through the spinal cord.

Injury to different parts of this nervous system produce very different results. Should the whole cord be cut right across, as may occur in certain bullet wounds, all feeling and power of motion ceases in the limbs supplied by that part of the cord severed from communication with the brain. But this can be known only from the patient himself, for if the limbs be pricked or otherwise irritated, movements occur, these being due to the ganglia above-mentioned, which seem to act as a kind of small local brain, producing movements of which the sufferer is unconscious. This is called reflex action, and this reflex or ganglionic action in the functions of the heart, lungs, and digestive organs, plays an even greater part in the human economy than the conscious life of the central brain.

Should the injury be to the anterior roots of a pair of nerves going to one of the limbs, these anterior roots being divided while the posterior roots are uninjured,

though the parts supplied by the nerve will be limp and paralysed in respect of motion, they will retain their full sensibility. If, on the contrary, the injury has been to the posterior root, the power of motion will remain, but the parts may be pierced, burned, or cut without causing pain. It is not unusual to divide the nerve-branch to the posterior root for certain foot diseases of the horse, with the object of leaving the animal the painless use of a hopelessly diseased limb. From many similar facts it appears that the posterior nerve-roots carry to the sensorium impulses which are felt as sensations, while the anterior roots carry impulses from the sensorium which causes motion. This is expressed by saying that the one set of fibres is motor, and the other set sensory. "But inasmuch as we shall see reason for thinking that centripetal impulses reaching the spinal cord, and indeed other parts of the central nervous system, may modify reflex or other activity without giving rise to a sensation, it is advisable to reserve the terms efferent and afferent as more general modes of expression than motor and sensory." (*Foster*, vol. iii., p. 916).

As the human body consists of two halves very nearly symmetrical on either side of the spinal column, it is clear that if each side of the brain were connected exclusively to its own side of the body and limbs, the right and left halves of the organism would be to a very considerable degree independent of one another. Accordingly, the main trunks of the nerves which carry sensation from the right side of the body cross over (decussate) to the left side of the spinal cord, and *vice versâ;* while the fascicles of nerves, which carry motor impulses, similarly cross over just below the base of the brain. Each side of the body is, therefore, chiefly (though not entirely) connected with the opposite side of the brain, both as regards its sensory and motor fibres; but the sensory fibres cross over all along the spinal cord, while the motor fibres cross just below the brain.

There is also in the hind brain a most important tract whose special function is to unify the motor impulses, and probably to a certain extent the sensory impressions also, but, for the sake of simplicity, this rough sketch of the nervous system can take no account of its function.

In appearance all nerves are alike, but physiologists place them in two great classes, according to their uses, and distinguish the members of each group by minor differences of function. These functions are expressed in tabular form below :—

Class I. AFFERENT (SENSORY). — Separated into Groups.

- (*a*). Nerves of common sensation, or touch.
- (*b*). Nerves of special sense, smell, sight, hearing.
- (*c*). Nerves which minister to reflex action, which is so closely bound up with sensation that these are called excito-motor nerves.

Bound up for the most part with the same nerve trunks are :—

Class II. EFFERENT (MOTOR). — Separated into Groups.

- (*a*). Nerves which move voluntary muscle.
- (*b*). Nerves which move involuntary muscle, giving rise to circulatory, digestive, and other movements not under control of the will.
- (*c*). Nerves which stimulate secreting glands.
- (*d*). Nerves which minister in some special way to the nutrition of a part, injury to them resulting in atrophy of that part. (Trophic nerves.)
- (*e*). Nerves which check the action of others for a time, by which we are enabled to "keep still," or to perform rhythmic motions. (Inhibitory.)
- (*f*). Nerves which dilate the blood-vessels of particular parts. (Vaso-motor.)*

* Dr. Power's *Elementary Physiology*, p. 314.

There are, in fact, two great sets of nervous conductors symmetrically arranged all over the body — the first (sensory) leading from the outer surfaces and from the organs towards the brain; and the other (motor) leading outwards from the brain to the muscles and the organs, the former being the mechanism of sensation, and the latter of motion voluntary or involuntary. All movement, conscious or unconscious, is preceded by a nervous impulse, and as functional movement is continuous, the nervous flow must be continuous also—in short, all functions of whatever kind are dependent on these impulses which stimulate activity, and are conveyed by the continuous conductor which places all parts of the organism in connection with the great central dynamo-station and telegraph office, at whose arrangements we shall now take a superficial glance.

3. The General Structure of the Brain. Within the last few years a great light has been thrown on the machinery of sensation, thought, and action by the researches of Dr. Luys, who has dissected the brain into successive thin slices from top to base and from back to front, and, photographing each of these hundreds of slices under the microscope, has built up maps of the brain, which enable its general structures to be studied from the point where they take their rise to that where they terminate.* The fascicles of sensory and motor nerves which are gathered into each side of the spinal cord, mostly pass each into one of two distinct regions at the base of the brain, the sensory nerves into one distinct mass of nerve substance, and the motor nerves into another equally distinct but dissimilar mass, called from its curiously-striped appearance the corpus striatum.

To the former converge also the nerves of smell and taste (practically one), of sight and of hearing; and the

* *The Brain and its Functions.* Dr. J. Luys, Physician to the Hospice de la Salpêtrière. (Kegan Paul, 1883.)

optic nerve being the most conspicuous of these, the mass in question early received the name of the optic lobe (thalamus).

In this mass of nerve substance there are four separate nerve centres, corresponding to the sense of touch and to the special senses above-named; and that the exercise of these senses depends on the centres in question, quite as much as on the eye or ear, is proved by such cases as that quoted from Dr. Hunter by Professor Luys, in which there was successive loss of smell, sight, sensation, and hearing; the autopsy revealing the traces of progressive consumptive disease affecting these four nerve-centres in this order, the organs of smell, sight, and hearing themselves being quite healthy. Professor Luys thus sums up: "We may, therefore, legitimately conclude that the isolated ganglions of the optic thalamus are so many independent departments for each kind of sensorial impressions, and that the destruction of each of them may lead to the disappearance or alteration of the function to which it is specially devoted."

From these centres large numbers of fibrils radiate towards the surface of the brain, the centre of sensation being connected with all parts of this surface, and the others more especially with certain parts of it.

This "surface" of the brain wherein these fibrils end is of very peculiar construction. It is grey in colour, and forms a kind of rind, or "cortex," to the inner white substance which composes the mass of the brain. The microscope shows that the greyness is due to millions of tiny nerve-cells more or less pyramidal in form, arranged radially from the centre of the brain, towards which their bases are turned. From each of these cells proceed very delicate tufts of sensitive protoplasm, and in these tufts originate nerve fibres, which pass through the cell and form delicate rootlet-like fringes on the other side, the whole being imbedded in a matrix of white nerve substance. Each such cell is called a neuron, and consists essentially of

a nerve fibre or axis proceeding through the cell which nourishes it.

The fibres from the centres of sensation in the optic lobe pass towards these cells, and among them they are lost. Here we touch the profoundest mystery of physical life, the transformation of an external effect into consciousness. Here, among these tiny rootlets, ends the whole elaborate mechanism of innervation which converges towards the brain, and here for the present is the limit of our knowledge.

So far the cortex. But just as it was necessary for the due co-ordination of the right and left halves of the body that each should be connected with the left and right halves of the brain, so must the opposite sides of the brain be connected if co-ordination is to be complete. There are, in fact, in addition to the sensory fibres proceeding from the optic thalamus to the cortex, numbers of other white fibres which cross from right to left and connect similar psycho-motor centres* and other homologous regions of the two lobes of the brain ; so that an impression produced by the nerve-current in one group of cells is communicated to

* In this cortex there are many convolutions, and examination of the brains of animals shows that there is a close connection between the number and complexity of the convolutions and the intelligence of their possessor. The human brain, though not differing in general structural plan from that of the highest brutes, is so much more highly developed and convoluted as to stand in a class quite by itself. But whether human or anthropoid, it has long been known that certain convolutions (portions of the cortex) have to do with the motion of particular muscles, and others with certain forms of consciousness and trains of idea. Dr. Bartholow, professor in the medical college of Ohio, found, with a patient suffering from severe injuries to the skull which exposed the brain, that slight electrification of particular portions of the cortex caused motion of particular muscles, such as those of the eyes, tongue, neck, fingers, arms, legs, &c. Many such experiments have demonstrated that particular tracts have an intimate connection with particular sets of muscles, these tracts or convolutions being known as psycho-motor centres ; and it is more than probable that each muscle in the body has its own centre in the brain and conducting fibrils.

all those with which it is, as it were, in telephonic communication. These transverse fibres complete the system of sensory nerves which pass inwards from the skin and end in the million-celled organ which conceals the instantaneous change from the physical nerve-current (which is not sensation till it reaches the cortex) to psychic consciousness. This is the flash of perception which, continually repeated from moment to moment, constitutes the stream of consciousness we are each of us aware of as our life in Time.

Besides the set of fibres which radiate from the optic lobe upwards, and the cross fibres which connect similar regions on opposites sides of the head, the researches of physiologists have revealed a system of fibres, which, beginning in the surface of the brain, runs downwards towards the great motor nerves and end in the muscles. These fibres converge in the first place to the motor centres in the corpus striatum, which, by similar experiment and reasoning to that which determines the optic lobe to be a meeting-place for ascending (sensory) impressions, can be shown to be a meeting-place for motor impulses descending from the cortex. Here also are four nervous centres, each closely connected with the special activities of the organs of sense, and from these descend into the spinal cord those fascicles of nerves which pass out from it by the anterior roots to convey stimulus to the muscles in which they terminate.

4. Functions of the Nervous Mechanism. — We are now in a position to trace the course of an impression. Inasmuch as the tension or "tone" of the whole body is continuously maintained, and the actions of breathing, blood circulation, growth and trophic change are continuous, it is clear that the nerve-current which gives rise to these must be continuous also. Analogy of growth from the primitive groove, and another line of argument connected with bodily waste, makes it seem probable that this

current originates in those parts of the nervous system where actual disintegration of nerve substance takes place, liberating nervous power. But however this may be, a current* there certainly is, and disturbances of this current by an exterior agent are conveyed by the main conductor (the "sensory" nerves of the spinal cord) to the appropriate centres in the optic lobe, and thence again to the centres where special discharges of nervous power would seem to be set free, the amount and quality of these being probably dependent on the nature and previous arrangement of the cells, and the kind of disturbance which reaches them.

No sooner has the transformation from physical nerve-current to psychic sensation taken place, than a reconversion into the physical begins. The perturbation of the continuous nerve-current was purely physical till it reached the surface of the brain and flashed into consciousness; this consciousness then originates a return current, or modifies the constant current, to produce a motor impulse. Here the physical touches the psychic so closely that it is mere speculative rashness to attempt to separate them. But it is clear that whatever changes may take place in the abyss of being which lies in that little span of grey matter, there emerges thence a physical motor impulse, which finds its way through the return wire of the main conductor, expends itself in muscular contraction and is dissipated according to the ordinary laws of energy, as heat and work. This, in roughest outline, is the path of changes which we call a sensation and its resulting voluntary act.

In the marvellous microcosmic world of human structure there are, in addition, hundreds of bypaths along which run conscious, semi-conscious, and unconscious impulses; some

* "Current." This term does not involve necessarily a transfer or flow of matter. The analogy of water in a pipe was applied to the flow of electrical power along a wire, and in this case "current" means certain effects produced in or near a conductor. The term is used in a similar sense physiologically.

for the many acts which, like swallowing, are partly under control, but many more for a vast number of nutritive, circulatory, and secretory changes which are not; to say nothing of the underworld of mental change not yet come into manifestation, and of instinctive subliminal knowledge for the analysis of which there are as yet no data.

But the broad general truth is clear enough, and it throws a very distinct light on many processes both bodily and mental, especially on those which are especially associated with our conscious life. The impressions which fall upon our nerves produce many results, conscious and unconscious. "When the impulse runs from the skin to a ganglion which has motor connections independent of the brain, reflex action follows; if the connections are both to the brain and to voluntary (striated) muscle by a motor nerve, there will be both reflex and conscious action; if in addition the ganglion is connected to the vaso-motor system—that set of ganglia which is connected with the heart, intestines, and other internal organs—these also may participate in the disturbance, and we may turn pale, shed tears, and so on. The brain-cells which receive the sensory current are stimulated, and 'thoughts' are started. The paths which the nerve-impulse follows and the activity which it starts in a number of cells of the brain, the spinal cord and the ganglia, are hypotheses no more. And when the anatomist maintains that an irritation of the skin will be transmitted in this way and not in another, to such cells in such cases, and start into activity such cells of the brain, this is speculation no longer. It is a fact of natural science, firmly established and verified in different ways by a mass of mutually controlled observations."

Those which fall upon the nerves of special sense, such as our eyes and ears, are transmitted to the brain, and there determine certain paths of nervous discharge, some of which are the representation to consciousness of their causes. The voluntary redirection of this discharge along

the same paths constitutes an act of memory, vivid in proportion as the original discharges are more or less exactly reproduced; and when these are sufficiently strong, the impression amounts to a visualization of objects which have been actually seen or whose component ideas have been seen or visualized on previous occasions. Association of idea, which plays so considerable a part in our mental processes, is the natural result of the allied sensations which accompanied the original impulse, or one or other of its subsequent or similar repetitions, and it follows naturally, *cæteris paribus*, that the durability of impressions made on similar minds will be proportionate to the extent and variety of nervous action which those impressions set in motion.

If this theory of memory be sound, no argument is needed to show how much more impressive must be the teaching which appeals to two or three senses, and, linked to the child's own past experiences, becomes part of the fabric of his life, than that which appeals to the single sense of hearing by means of words. Apart from the fact that words are mere conventions of unmeaning sound to a child till he has built up a meaning for them out of the more or less distinct images of his experience, it is clear that no words can affect as large a tract, or produce impressions as vivid and associations as numerous, as the sense-perception of the things themselves. Thus there is a natural reason why history teaching which is a mere rehearsal of names and dates should fade from the mind, while that which is based on a mind picture of a race by means of presentation of their dress, arms, tools, architecture, literature, and social life remains; that actual experiment in chemistry or physics—the "heuristic" method, which makes the learner discover for himself in logical order—should leave impressions which are too vivid to be obliterated, while the mere description of apparatus and experiments learned out of books vanish away.

Verbal mathematical rules are clearly remembered only by children already predisposed to mathematical learning; but learned by concrete examples, by weighing, measuring, and by true geometry dealing with concrete and clear cut shapes, it becomes fixed in the mind, which is thus trained to make each particular experience lead up to the generalization which it cannot forget if it would.

There is also another fact which throws light on the great persistency of impressions made in childhood. All growth is of course the generation of new cells from cells already existent, and it is natural that the cells which so spring into being should partake of the nature of the mother-cells, just as the new cells which constitute the growth of the grafted tea-roses bud on a wild brier should produce cells of the nature of the bud, and not of that of the stock. Dr. Luys writes:—"In the first years of life the cerebral substance is in perpetual exercise and organic development. New elements are perpetually being added to old ones, and . . . we are led to conclude that the daughter-cells which appear, receive from the mother-cells which give them birth a species of hereditary transmission of the different states of these mother-cells . . . and to these mysterious bonds of relationship we must look for the secret of the perennial character of certain memories."

The physiological basis of habit is not less obvious. "Inter-communicating nerve-paths are marked out in the brain, . . . at every repetition of a movement or set of associated movements, the cells act more readily and with less effort of will, for the nerve-paths become more clearly marked out, and impressions tend to slide more readily along them, until in time the movements or combined actions become almost unconscious or automatic. They have become habit, bad or good; they possess the body, which loses control over them. Transfer the picture to the intellectual sphere, and we see the same formation of mental

habits as is found in the less mysterious muscular training.* Inasmuch as the nervous discharge precedes all outward acts, this applies to all kinds of habits without distinction, and explains alike their formation and the difficulty felt in changing them.

Lastly, we may see here some light on the moral law, that it does not suffice to abstain from evil in act, but that all true repentance is a μετανοια, a turning of the desire by which internal energies are directed. For this desire has the mysterious power of reproducing to consciousness the sensations associated with its object, and of stimulating and directing the nerve-flow along definite lines. The flow so initiated becomes more and more a part of the consciousness at the moment, and tends also to develop a habit, and therefore no mere abstention from the act of intemperance or anger can ever suffice to abolish the tendency to any one of these. For as surely as the voluntary calling up of the forbidden images in the mind stimulates the nerve-flow, and directs it along channels which affect the whole system and lead to realization in act, so surely will that realization from time to time repeat the Fall, which immutably follows hard upon allowed Desire.

5. The Mechanics of Thought. It would appear, therefore, that the fibres of the grey cortex are association pathways along which the nerve-current produces consciousness and thought. The complexity of this marvellous system is somewhat simplified to the understanding by the fact that it is composed of a multitude of units built on the same ground plan, a plan which is a microscopic type of the whole. The "neuron" or nerve element is a single club-shaped cell of protoplasm, from one side of which proceed short tufts of grey matter (dendrons), and from the other one or more compound nerve fibres, each

* *Our Growing Children.* Dr. Gerard Smith, M.R.C.S. (John Ball, 1896.)

made up of many exceedingly delicate fibrils.* These lie in tracts, which have special connections with other parts of the body with which their activity is closely associated.

The fibrils which make up the fibre or nerve-axis of the unit neuron (axis-cylinder or axon) seem to originate in the sensitive tufts (dendrons) and pass through the cell body,† which probably serves them with nourishment. They are conductors of the nerve-current, the dendrons conveying irritation towards the cell, while the sheathed nerve fibres convey current from it. "Neurons of the brain and spinal cord transmit nerve impulses to each other, and nerve currents are sent through other neurons to the arms and legs, to different muscles of the face, to the heart, to the blood vessels and to different other cells of the brain itself," and out of all these but a very small portion reach our consciousness.‡ But it is with those which do reach our consciousness that the educationist is most concerned.

While the brain was thought to consist of a mass of neurons in contact, there was no satisfactory explanation

*This has been revealed by the fact that although the differences of structure between the parts of the neuron are too slight to be seen with the microscope, nevertheless they have different affinities for chemicals. Professor Golgi, of Pavia, found (1885) that treatment with chromic and osmic acid, followed by silver nitrate, brought out with surprising clearness the intimate structure of the cells of the cortex, and showed that their fibres, instead of forming a felted mass of nerves touching one another, are not in permanent contact. There is a gap between neighbouring neurons of, it may be no more than $\frac{1}{10000}$ of an inch, but they are separated by other matter of different affinities, whose function is not yet clearly defined. "Meynert, Max Schultze, R. Wagner, Kölliker, Gowers, Weigert, Bevan Lewis, Golgi, Ramon y Cajal, Nissl, Flechsig, and others" have "revealed paths of conduction between the outer world and the regions of highest cerebral functions, between hemisphere and hemisphere, between convolution and convolution, and between the tracts of the special organs of sense." (Address of Sir John B. Tuke, Pres. R.C.P. Edin., *Lancet*, August 6th, 1898.)

†Max Schultze.

‡Hence the study of psychic changes by internal perception alone must always be quite illusory.

why an impulse spreading in such a mass of neurons should excite definite lines of activity and arouse certain associations only. But the discovery that the ends of the fibres (axons) are not in permanent contact, has thrown a new light on the processes of thought. As the nerves pass on their current in the brain by definite paths in each case, awakening one set of associations only, it is clear that there must be some mode of making and breaking contact between neighbouring neurons. Different thoughts imply different lines of contact. Three hypotheses of the means by which contact is made and broken are in the field, of which that of Professor Ramon y Cajal is perhaps the best supported, and agrees best with the observations of Widersheim on the living neurons in a ganglion of a little crustacean *(Leptodora hyalina)*, which has so transparent a body and skin that the nerve can be observed in full activity. The cells "are endowed with a wonderful mobility. Like little amœbas they change their forms, protrude ramifications and draw them in. And the proof that the little brain was working in its own crustacean way whilst Widersheim observed it, was that its cells exhibited the same symptoms of fatigue which Dr. Hodge discovered in the nerve-cells of the higher animals, their contents became troubled, and the same vacuoles appeared in their protoplasm."

Perhaps the theory of Dr. Lugaro of Florence, sketched in the *British Medical Journal* of January, 1899 (p. 93), will be confirmed—that the normal nerve-flow takes place through many contacts of the dendritic nerve filaments, which are too numerous and diffuse to provoke consciousness; but that under stimulus this current is directed along special paths, its intensity then provoking psychic reactions; but whichever explanation may ultimately be found to best cover known facts, these facts present the association-pathways in a new light, and give a satisfactory reason why nervous discharge should be readily repeated.

Whether the neurons lengthen to make, or shorten to break, contact under the stimulus, there is as much reason for the easier repetition of that action as for the increased facility which comes of any other form of exercise, and also that these association-pathways should increase in number and complexity just as muscle increases by use.

But we are not left to inference in this latter case. The development of these pathways is visibly a gradual process, just as we know by experience that their use is gradually acquired. In the infant brain the dendrons and fibres are but imperfectly developed. Not only is the whole brain smaller, but it is less complete; the neurons are not only far fewer in number as a whole, but in any given area of the brain they are less close together, and they are smoother in outline, with fewer tufts or "tails" of nerve fibres (dendrons and dendrites). The "tails" of the cells grow as the child grows, and it is no exaggeration therefore to say that the stages of development of the conductors of nerve discharge or thought-paths can actually be seen. In the adult brain they form a marvellously intricate network of intercommunicating cells; but in the aged, where brain failure has been marked in life, the brain-cells again present the appearance of infancy—they have lost their processes. "In the very senile period, say at seventy-five and eighty, the cell body appears granular and has fewer processes as prepared by the Bevan Lewis method; as prepared by the Nissl method, its chromatic granules are disposed differently; and as prepared by the Golgi method, its dendrites and their gemmules are changed, and many of them have undergone atrophy or bulbous swelling. The actual number of neurons in any given field of the microscope is fewer than in youth, just as is seen in brain sections from dements."—(T. S. Clouston, F.R.C.S.E.)*

*Of course none of these facts makes man an automaton. How life builds this wonderful mechanism from the primitive neuron is as profoundly mysterious as the mode by which the will uses this same mechanism. And

The bearing of these facts on instruction is not far to seek. No instruction can confer genius, but it can make development orderly, and initiate good habits of body and mind; and in the words of one of the discoverers who has done so much to clear up these mysteries of the infinitely little, "It is not unreasonable to presume that the development of such association-pathways, as well as a full development of protoplasmic and nerve-fibre ramifications of the cerebral neurons, are of greater importance for the development of a higher intelligence than the size or even the weight of the brain."

It is evident that whether the arrangement of these pathways is orderly or otherwise must depend largely on mental experiences. It is even probable that each cell and sheathed fibre, and each fibril, in these has its own particular function in mental and bodily action, regulated by the circumstances under which it came into being and by the purposes for which it has been used. Dr. Fothergill remarks that the fact that a man who has lost his arm will still localise impressions in his fingers, proves that in addition to those large psycho-motor centres with which we are familiar, there must further be much smaller tracts appropriated to the impressions coming from and the impulses going to small muscles and organs: and this

the great facts remain that not only is it true that the higher self can by orderly thought and mental and bodily self-control make the association-pathways orderly, durable, and healthy, but even that "it seems certain that the simple direction of consciousness to a part, independently of emotional excitement, but with the expectation that some change will take place in its organic activity, is often sufficient to induce such an alteration; and would probably always do so if the concentration of the attention were sufficient."—(Dr. W. B. Carpenter, F.R.S.) This sentence is one of those which illuminate a wide field, for the "direction of consciousness" being the direction of the nerve-current which is the means of growth and change, it becomes possible that processes of development and healing may both be strongly affected by the action of the mind, if indeed it do not ultimately appear that the directing of this nerve-current is the mode in which both remedial and educative agencies principally act.

agrees with the fact that the extinction of particular tracts in the brain is accompanied not only with the loss of particular sensations, but of particular memories also.

"Nor is this complexity surprising when we reflect that some 600,000,000 of these cells are reckoned in the cortex, which would allow fifty for each minute of a long life to receive separate impressions." (Dr. Wilks.)

Allusion has been made above to the discoveries of Hodges and Widersheim that the exhaustion of a nerve-cell produces inability to respond to stimulus, that its contents become turbid, and that small empty spaces appear in its substance; and to Lugaro's observations on the retraction of gemmules and formation of varicosities on a dendron. These changes are made good in repose, and when the cell is renewed it can again give forth the current which is its activity. When the nerve-cells are exhausted, the current is weak or slow; the time taken to depress a key indicating that a momentary sight, sound or touch has been seen, heard or felt, is much lengthened. This "reaction-time" varies in the same boy with his general health, and varies so much in different boys that it is highly probable that much which is miscalled stupidity is simply slow reaction, due sometimes to ill-health, sometimes to imperfect development. The correspondence with common experience is patent. Weariness of particular cells by exhaustion of their powers deprives them temporarily of function, and this explains how words and thoughts once familiar escape the over-wrought brain. Not only so, but over-stimulus may go so far as to injure the cell beyond recovery, causing it to waste away. The former is the physiological interpretation of "brain-fag" and "over-pressure," the latter its extreme result—that the injured cells either require prolonged rest and relief from strain of any kind, or do not recover at all; and the brilliant product of the intellectual forcing-house, after winning his academic laurels, settles down to mediocrity, or less than mediocrity, for life.

This enfeeblement or extinction of certain nerve-cells not only deprives the organism of certain lines of association, but also reduces the number and diminishes the vigour of the sources of nerve-current for all the purposes of life. It gives rise to the condition known as Nervous Exhaustion, and explains the general injury to the constitution which results from the over-pressure which year by year visibly defeats its own object by making its victims less instead of more fitted for the stress of life. Overstrain is therefore the exhaustion of the nervous system from whatever cause, and is the physiological result and meaning of the over-pressure of modern life, with its nervous diseases and its impaired physique.*

*The preceding paragraphs are an outline summary of the work of specialists. Acknowledgments are due to Dr. J. Milner Fothergill, M.D. (*Diseases of Sedentary and Advanced Life*); to Dr. T. S. Clouston, F.R.C.S.E. (Address: Psychology, Brit. Med. Ass., Edinburgh, July 1898); to Sir John Batty Tuke, M.D. (Address: Psychological Medicine, Brit. Med. Ass., Edinburgh, 1898), reported in the *Lancet* and *British Medical Journal* of that month; to Professor Michael Foster, M.A., M.D., LL.D., F.R.S., and Professor Sherrington, M.A., M.D., F.R.S. (*Text-book of Physiology*, 7th ed., 1897); to Professor Luys, Phys. La Salpêtrière (*Brain and its Function*); to Dr. Francis Warner, M.D., F.R.C.P., F.R.C.S.; to Mr. Gerard Smith, M.R.C.S., and others. To these apologies are due as well as acknowledgments, for it is not possible to condense and popularize exact scientific work without omitting much that is almost as essential as the outlines that are given.

We have also reproduced one or two passages from the brilliant summaries of contemporary science communicated by Prince Krapotkin to the *Nineteenth Century*, July 1897.

Chapter II.

NERVOUS ENERGY.

"In all intellectual exercise a point is reached where stimulation of the brain-cells ceases to enhance their activity, and intellectual exercise pressed beyond this point causes a retardation of the blood-current, a shrinkage of nerve-cells and their nuclei, and a diminished elimination of the substances resulting from the decomposition of the cytoplasm, which, accumulating in the system, cause drowsiness, depression, headache, or a sense of uneasiness or pain. Exercise of this kind, producing fatigue, does not increase the strength or energy of the cells, but leaves them really crippled to some extent by auto-intoxication, and, if too often repeated, may lead to their degeneration and to very far-reaching and baleful consequences."—*Sir James Crichton Browne, M.D.*

1. The Problem of Educational Over-pressure. There are two well-marked varieties of physical action which are both termed "currents," the former involving a transference of matter, the latter a transference of power. Examples of the former are the flow of water in a river, of gas in a pipe, of blood in a vein, of air across the land. The latter kind of flow, involving no transfer of ordinary matter, but of power only, is even more common, being the flow of solar, magnetic and electrical radiation in the midst of which we live, but is less noticed because invisible.

Nerve current is of the latter kind, in this respect resembling the electric flow along a wire. However complex the functions and intricate the paths of the nerve currents, in one thing they are alike. Each and all are transformations of power, the nervous "flow" is a flow of energy just as much as is the electric current, to which it offers some curious resemblances. That is to say, it must

correspond to quite definite amounts of the purely physical energy contained in foods.* It is with this energy that nutrition is principally concerned, the amount of matter that food daily yields to the system being small, while the energy it parts with is large. It is this energy, invisible and imponderable, but capable of very definite measurement in other ways, which is the driving force of the animal mechanism, and, directed by a wisdom transcending our experience and our imagination alike, builds up the human bodily structure. But however directed, this flow of power is itself purely physical, and follows physical laws—it is dissipated just as all other power is dissipated, in heat, and renewed by fresh supplies. The exercise of a particular limb or organ is effected by increased nerve-current, fatigue results from the using up of tissue (the products of such consumption being removed by the blood and eliminated from it by special organs such as the liver, which in turn are set into activity by their special nerve-flow), while afterwards the local irritation caused by the waste determines (through the vaso-motor nerves) the extra blood supply which is to repair that waste during the hours of rest. Thus the cycle of local nutrition is completed, and

* Class.	Type.	Force value of 15 grs. (dry).	Composition.	Chief constituents of
i. Albumens .	White of egg.	13,851 foot pounds.	$C_{72}H_{112}N_{18}O_{23}$	Flesh (myosin), bread (gluten), cheese (casein).
ii. Fats . .	Butter.	27,716 foot pounds.	$C_{57}H_{104}O_6$	Fat of meat, milk, butter.
iii. Starches .	Starch. Grape sugar.	11,720 foot pounds.	$C_6H_{10}O_5$	Potatoes, sago, honey, cane sugar, grape sugar, in beer or wine.
iv. Inorganic constituents	Water.	Not known.	H_2O	Common salt, phosphate of lime, &c.

Ralfe, "*Exercise and Training*," quoted by J. M. Keating, M.D., and J. K. Young, M.D. "*Physical Development*," Keating's Cyclopœdia, Dis. Children.

this is equally true when the waste is nervous and not muscular, as in brain-work.

The nervous "flow" is, in short, the prime mover in the bodily changes of growth, secretion, exercise, and thought, which make up the phenomena of life. Each of these uses up the energy given to it, leaving correspondingly less for other functions. Overworked children cannot grow, and overgrown children cannot work, up to normal standards. Insufficiency of this current of energy is the cause of "overstrain," and medical opinion is daily becoming more pronounced that defect in its quantity and quality is the common factor in many diseases. Thus Dr. Tyrrell (*Nervous Exhaustion*, second edition, 1893), writes: "We are, I think, far too apt to undervalue the influence of exhausted states of the nervous constitution in the production of disease, and to elevate what are merely symptoms of nervous failure into the unmerited position of diseases—to recognise and treat effects as though they were causes; just as, with the causes themselves, we are apt to class those which are merely the exciting, as predisposing or ultimate causes. For instance, we talk of a neuralgia being due to cold or exposure, passing by entirely the condition of nervous exhaustion on which the disease is really founded, and without which it could not possibly have arisen."

Insufficient nerve-power is first manifest as a susceptibility to slight changes of cold, damp, bodily or mental stress, or noxious influences of any kind. *Lowered nervous vitality reduces the power of resistance to such influences, and they react on the sources of nutrition, impairing digestion and cutting off the supply of power at its source, till complete rest—the diversion of the entire fund of nervous energy to nerve restoration—is imperatively demanded. This is the cycle of malnutrition, with which far too many of us are practically acquainted.*

This diminished power of resistance to slight causes of

disturbance is not only apparent in us, but in our little ones also, and here, after a long but necessary anatomical digression, we return to the children. Their susceptibility to colds, headaches, indigestion and other ailments is, as has before been observed, markedly increasing, and more pronounced forms of nervous instability are not uncommon.

This fact, taken together with the increased demands of modern life, brings us face to face with the real educational problem. THERE IS OVERSTRAIN, AND THERE MUST BE A HIGH STANDARD—HOW CAN THE FORMER BE AVOIDED WHILE THE LATTER IS MAINTAINED?

The educational problem, therefore, has become primarily one of the economy and the direction of energy, for this energy is not only the driving power of the human mechanism, but, governing the expenditure, it also indirectly determines the recuperation, and therefore the growth also, for growth is mainly the restoration of expended tissue, and follows function. Cases of pronounced nervous instability demand of course special treatment, but all treatment must be directed to setting up that cycle of exercise, nutrition, and rest whose performance constitutes health, and whose maintenance is the sole purpose of drugs and regimen.

As soon as this has been established, healthy development has begun, and normal process will then fortify the whole constitution in due time. The same principles govern the cases of children who readily "catch cold" or show susceptibility to ailments generally; the trouble is not effectively dealt with by guarding them from all changes of temperature or by special dietary, neither by mother's "coddling" nor father's "hardening," which I have known to produce disastrous results; but *by a regimen under which nutrition, exercise, and sleep are duly balanced, according to the powers and needs of the child, and the line which separates healthy weariness from exhaustion is never overstepped.* And where the mind is kept braced

and the faculties alive by exercises and interests within its powers, exactly the same healthy, happy tone is observable in mental as in bodily exercises.

It is the *continuous* demand of environing conditions which determines growth. Daily exercise of a muscle develops it; spasmodic exercise wearies it. Regular distribution of nerve-current by regular stimulus and repair is the secret of growth, *i.e.*, regular regimen and no changes. For this reason life in a school, where regimen is good and hours are well proportioned, is often better than in the home, where these may be sacrificed to social demands.

But mental interests require time to develop and actual contact with things themselves, with Nature in her many moods, with the common objects of the lanes and the shore, with simple mechanical models, with practical problems of number, space, and form, with actual literature and with the raw material of history, not with dry descriptions of these things in words necessarily ill-understood. Interest is very very rarely excited in verbal descriptions of things painfully learned and soon forgotten; indeed, so rarely is this the case that few teachers will believe that children will take a genuine interest in their work at all till about fourteen or fifteen years of age, and the programme advocated by us for the years 8–12 has been imagined to involve the very overstrain which it was planned to avoid, and which in practice is avoided by its use, because it answers to interests which are readily and easily awakened. It is conceded that the standard on which it is framed is not higher than is now needed for a liberal education on modern lines, but it is thought to be inapplicable to the age at which the course is to begin.

It is alleged that the age is too tender for study, and that work at this age would but increase the evil. But if a given amount of work has to be done under easier conditions, the only possibilities are either to begin it earlier, or to do it by improved methods, or both. We hope to show

that both of these are applicable to the problem. Parents naturally resist the suggestion to begin serious work at eight years old, because they think that it means the application to young children of the same process of cram which loss of time so often forces upon the later years, not perceiving that it may be the means of avoiding that cram altogether. It is objected that the early years should be spent in physical growth, to prepare for the strain which is thought to be inevitable later, and if the facts of growth show that physical development is greater at this age than at others, then clearly the objection cannot be put aside.

2. Rate of Normal Growth.—But, as a matter of fact, the eighth and next following years are by no means those of most rapid growth in the life-history of the normal child. The curves in the diagram annexed are the tabulated data from the works of the highest English authorities on the subject. Dr. Stephenson's results are from the statistics of height and weight of English-speaking races only, between the ages of five and eighteen years, and they are here supplemented by Dr. Roberts'* figures for earlier and later periods and for chest-girth, and by a few further figures from other recognised authorities. For well-grown boys—the best English type—all the curves should be raised about 2 inches in height, 3 in. in chest-girth, and 14 lbs. in weight. The careful study of these curves brings out some very interesting facts.

The diagram is spaced vertically in years from birth to maturity, and the vertical distance of each point (indicated by a little circle) from its datum line along each of these vertical lines, gives, in the scale to the right, the normal height in inches of a boy of the age referred to. Taking first the curve A. It will be noticed that during the first year growth is very rapid—from 19·7 inches at birth to

* *Physical Development and Proportions of the Human Body.* Dr. Roberts, F.R.C.S. Quoted from J. M. Keating's standard work on Children's Physiology.

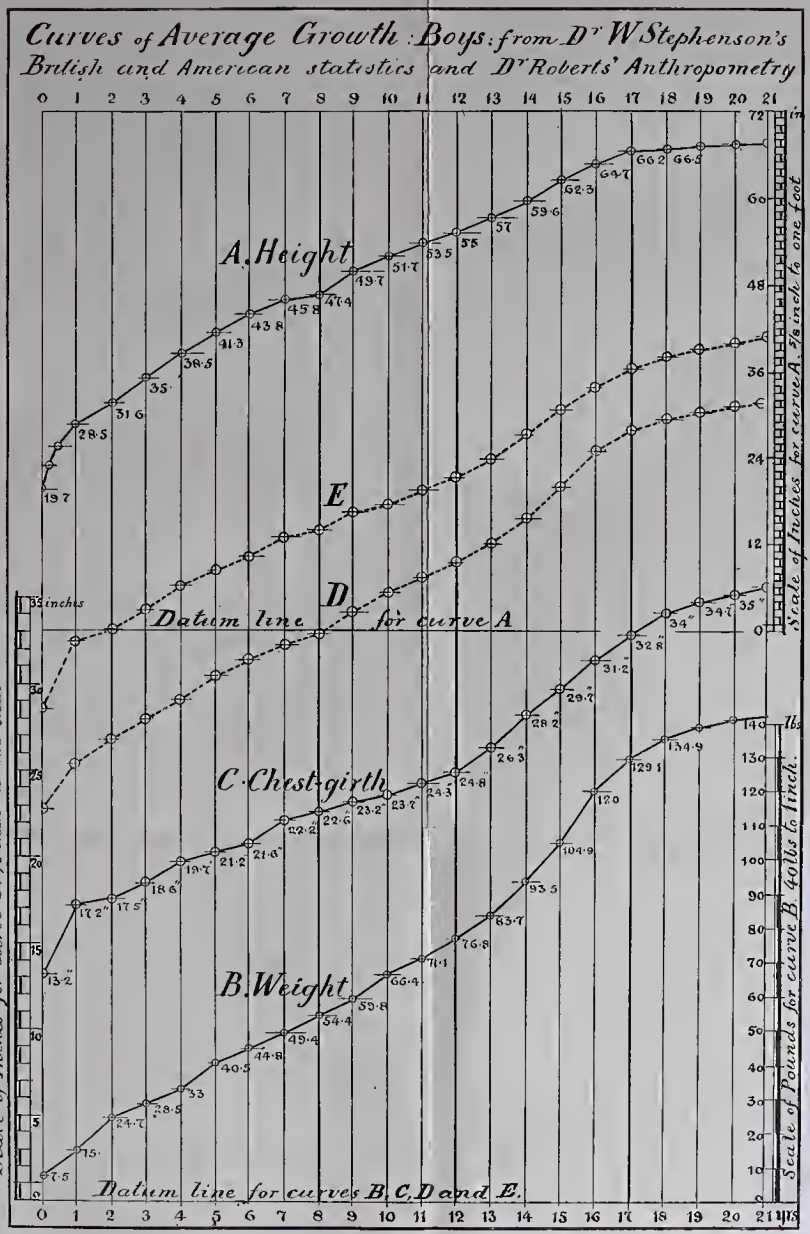

Curves of Average Growth: Boys: from Dr W Stephenson's
British and American statistics and Dr Roberts' Anthropometry
A. Height
E
D
Datum line for curve A
C. Chest-girth
B. Weight
Datum line for curves B, C, D and E.
Scale of Inches for curve C. ½ inch to one inch
Scale of Inches for curve A. ⅝ inch to one foot
Scale of Pounds for curve B. 4 olbs to 1 inch.
inches
in
lbs

Fig. 2.

28·5 inches at one year old. Thereafter it is nearly uniform to the seventh year, when it falls off (probably on account of the second dentition), after which it increases by not quite 2 inches a year up to twelve years old, when growth of 2 inches and over lasts up to seventeen, rapidly decreasing after this age.

The curve B, which gives in the same manner the increase in weight, shows that the average birth-weight of 7·5 lbs. doubles (15 lbs.) in the first year. Before the end of the fourth year the weight has again doubled (30 lbs.), but thereafter the growth is slow and regular, not reaching 60 lbs. till the ninth year (five years later), after which it is slow till the twelfth year, when it rapidly increases, reading 120 lbs. at sixteen years of age. The intervals of doubling are therefore one, two-and-a-half, five-and-a-half, and seven years; there being also a marked periodicity in this increase, the fourth and ninth years showing a falling off, and the thirteenth and succeeding years a decided quickening.

The curve C, of chest-girth, is somewhat less regular. A very rapid increase during the first year is followed by almost complete rest, and thereafter by an annual increase (with some slight oscillations) of about one inch up to the eighth year, when slow growth of about half-an-inch annually continues till the twelfth year, after which rapid increase sets in up to the seventeenth.

The results of both these curves have been combined in curves D and E. The former, curve D, is obtained by combining the height with the weight. If the growth be judged by neither height alone, nor by weight alone, but by both combined, its regularity from the second to the twelfth year is very remarkable, and its rhythmic character, as indicated by the slight drop about the third, eighth, and twelfth years, is very interesting. But the main fact is unmistakable, that rapid growth in height and weight ceases about the second year until the twelfth, when it begins again and lasts about four years.

If the general increase in massiveness be judged of by compounding height with chest-girth, the curve E confirms the last results, showing an early growth of great rapidity, followed by slow steady progress up to the twelfth year (with again a marked pause at eight), and a rapid development from twelve to seventeen years of age.

It may however be objected that though the rate of increase is fairly regular in these years, that the tax on the nervous energy involved in putting on an increment of 2·5 inches of height, 4·3 lbs. of weight, and ·4 inches of chest-girth at six years, when the whole mass of the body is but 44·8 lbs., involves much greater effort to it than equal amount in later years when the whole machine is so much larger. To test how far this objection is valid the following table has been calculated :—

Year of Age.	Successive Totals of			Increment in each Year.			Ratio of Increment to Last Year's Total.		
	Height. A.	Weight. B.	Chest Girth. C.	Height.	Weight.	Chest Girth.	Height.	Weight	Chest Girth.
	Inches.	Lbs.	Inches.						
Birth	19·7	7·5	13·2						
1	28·5	15·0	17·2	8.8	7·5	4·0	·45	1·00	·30
2	31·6	24·75	17·5	3·1	9·75	0·3	·11	·65	·27
3	35	28·80	18·6	**3·4**	4·05	1·1	·10	·16	·06
4	38·5	35·00	19·7	2·5	**6·20**	1·1	·07	**·21**	·05
5	41·3	40·49	21·2	2·8	5·49	**1·5**	·07	·16	**·07**
6	43·8	44·79	21·6	2·5	4·30	0·4	·06	·11	·01
7	45·8	49·39	22·2	2·0	4·60	0·6	·04	·10	·02
8	47·4	54·41	22·6	1·6	5·02	0·4	·03	·10	·01
9	49·7	59·82	23·2	**2·3**	5·41	0·6	·05	·10	·02
10	51·7	66·40	23·7	2·0	**6·58**	0·5	·05	**·11**	·03
11	53·5	71·09	24·3	1·8	4·69	**0·8**	·03	·07	·02
12	55	76·81	24·8	1·5	5·72	0·5	·02	·08	·06
13	57	83·75	26·3	2·0	6·94	1·5	·04	·09	·07
14	59·6	93·48	28·2	2·6	9·73	1·9	·04	·12	·05
15	62·3	104·90	29·7	**2·7**	11·42	1·5	·04	·12	·04
16	64·7	120·00	31·2	2·4	**15·10**	1·5	·03	·14	·05
17	66·2	129·19	32·8	1·5	9·19	**1·6**	·02	·08	·04
18	66·5	134·97	34	0·3	5·78	1·2	·04	·04	·02
19	—	—	34·7	—	—	0·7	—	—	·01
20	—	—	35·0	—	—	0·3	—	—	·01
21	—	—	35·3	—	—	0·3	—	—	·01

Heavy type indicates maxima, which will be seen to offer a regular interval and sequence.

The first three columns give the exact figures, which curves A, B, and C reproduce graphically; the second three give the increments of height, weight, and girth in successive years; and the third set gives the fractions which these increments are of the total height, weight, or girth of the preceding year. Admitting for the moment that the whole mass of the body is concerned in the conversion of energy for growth, it will be seen from this table that the numbers in the last three columns which represent a high ratio of growth end about the sixth year.

It is, however, more than doubtful whether the size of the growing body has much to do with the balance of energy available for growth, for increase of size brings with it increase of daily expenditure; and if it should be finally proved that the chief transformation of physical power into nervous energy depends rather upon the mass of the brain and the amount of food assimilated, then the twin facts—that the brain has attained nearly its full size by the seventh year, and the large appetite of a healthy child—would show that the source of what may be called organic energy is then in full activity.

These tables give averages; and averages collected under necessarily very varying conditions of heredity, food, and nurture, in the same social stratum, and from many social strata. The error due to "averages," as compared with "means," becomes more and more negligeable as the number of observations increases, and in these tables, which are the results of many thousands of observations, it may safely be neglected. But this does not imply that the tables express an absolute standard, but only what the average of English-speaking races really is, taking into account the stunted and ill-nourished children of manufacturing districts, healthy and unhealthy areas, and, in short, of all our children exactly as they stand. The curves therefore indicate a low physical standard. A table of a few thousand healthy and well-nourished children would give

better data for a normal healthy development, and of course such a table would give considerably higher results than those here given, and would go nearer to showing of what the race is capable under good average conditions.

But any tables, though they may not indicate an absolute standard, are, if similarly compiled, reliable for comparing the relative positions of individuals, and the schoolmaster who desires to watch how his boys progress can do so by the excellent method of grading explained in *Natural Inheritance* (F. Galton). For this purpose a set of twelve diagrams are required, each of which gives the curves of height, weight, and chest-girth for that year of a boy's age, with the percentages of deviation from the mean. The curves on it show, in fact, the number of boys having each successive inch of height, &c., between the maximum and the minimum limit. By ruling a hundred spaces on the diagram between these limits, a hundred grades are obtained according to which a boy may be placed, and his physical development followed from year to year. Thus if he were at eleven years old in grade 54 for height, 48 for weight, and 63 for chest-girth among other boys of his age, and a year later were found to stand among boys of twelve in grades 55, 49, and 64, this would indicate not only steady all round progress, but a relative progress among his fellows; and if the measurements at thirteen years were such as to place him in grades 55, 48, and 63, this would indicate a relative falling off in weight and chest-girth in spite of an absolute increase.

3. "Nerve Signs." Returning to the table of average growth, it is clear that there is no ground whatever for saying that a boy "shall be growing" between his seventh and thirteenth years. Of course he should, but we "grow by doing" in mind and body; act, think, and be conformed to our surroundings we must, whether we will or no; the only question is, how shall we act and think,

whether in disciplined order or in wayward and haphazard fashion. Healthy function of mind as well as of body is the best means of healthy growth, and this is a natural and pleasant process, for physical pain is primarily a warning of misdirected activity. The weariness which exhausts follows on quite short spells of distasteful and unsuitable work, while much heavier tasks which are congenial can be cheerfully and happily fulfilled, and are followed by the sense of triumph over difficulty and increased power, which is the true test of mental progress.

Nor are we left without a guide to learn our errors in treatment by irremediable results. Not only is it true that well-fed Board School children of six to twelve show only good results from the intellectual discipline of school life which many middle-class parents dread for their children of the same age who must be called on to face much severer intellectual stress, but we have also in the physical expression of the child an excellent guide to a sound judgment on our methods of dealing with him. Physical expression is defined as "the outward indication of some inherent property or function."* It is, in fact, the outward indications of the quantity and quality of the nervous flow, of how it has been directed in the past, and is being directed in the present.

Dr. Warner distinguishes two classes of expression—the fixed or immobile, which indicates the general conditions of heredity and past surroundings whose results make up the child's life history, and the changing or mobile expression, which is the reflect of the comparatively rapid changes going on from day to day, or at the moment. Thus the stature, weight, proportions, complexions, texture of the hair, colour and distance apart of the eyes, formation of the ears, shape of nose, mouth and palate, the size and shape of the head, and the permanent acuteness or dulness of the senses, are all of them particulars

* Dr. Warner, *Physical Expression*, p. 11 (Kegan Paul).

of the fixed expression, and all being built up by the nerve-force, indicate its general amount and trend from year to year. They will all doubtless receive much fuller interpretation than has yet been given by the physiologist, but meanwhile they reveal matters to be taken into account by the schoolmaster as a guide to what may or may not be reasonably expected in particular cases where any of them may be more or less abnormal.

It is, however, with the changing or mobile expression that he is most concerned, for this is the danger-signal which is hung out as a warning either to stop or to follow another track, but which is (I speak from experience) frequently or even generally disregarded. I have seen a class of young children whose fidgetiness after two hours' continuous lessons revealed a nervous tension which made further learning for the moment impossible, and the attempt to teach a pernicious waste of time, punished in the name of "discipline" for their inability, with the result of turning their whole energy to the task of keeping quiet, the lesson being actually unheard. I have often seen well-meaning teachers endeavouring to compel a boy, already clearly suffering from exhaustion, to give "more care and attention" by means of impositions, having the effect of dulling his brain still further. Canon Farrar has shown in an excellent little tale of school life*—which still, I gladly see, retains its popularity—one way in which a young boy may become a sloven and a dullard under the eyes of cultured and conscientious, but quite unobservant, masters; and I have seen in two large public schools, among boys between twelve and sixteen, some 30 per cent., at a low estimate, showing the dulled complexion, indirect gaze, arrested development and slouching gait, which indicate pronounced nervous misdirection, without the masters having their attention aroused to the obvious inference

* *St. Winifred's.*

that there must be some cause at work to produce these results.*

The working of the brain cannot indeed be seen, but it can be known with certainty by applying the fact that every movement of the body, voluntary and involuntary, corresponds to the action of a certain part of the nervous system—probably to discharge of energy from a specific area. The mobile expression is therefore a sure guide to brain condition.† It shows, in fact, how the nervous energy

* *Cf.* Report referred to on p. 2, with this percentage estimated by inspection.

† *The Study of Children*, Dr. Francis Warner, 1897, p. 39, to which we gratefully acknowledge our indebtedness. Some of Dr. Warner's observations during inspection of high-class schools are so instructive, that they are here reproduced in a slightly condensed form.

Case 8.—Boy, big and loud-voiced. Defective development shown by ill-shaped ears, and head too round; excessive and coarse action of muscles of the forehead; over-muscular action of the face lessened as the lecture proceeded. Symmetry of this action showed that there was no nervous exhaustion, but defective organisation.

Case 10.—Boy, 2nd in class, fair, small in stature, exhausted, too little mobility in limbs and face, dulled expression, horizontally-furrowed forehead, fulness under eyes. No developmental defects.

Case 14.—Boy, well-developed. Father pressed head-master to make him work more and rise in school, master having a similar desire, though he said the boy already worked well. Far too much movement, and signs that his nerve system was exhausted.

Case 20.—Boy, 12 years, "weak" balance of hand and body, dull face, fulness under eyes, speech good; no developmental defect. Teacher called him "an idiot, who could learn nothing." Marked signs of exhaustion. Inquiry showed his evening preparation lasted to midnight.

Case 21.—Girl, 12 years, comes to school pale and tired, relaxed eye-muscles, wandering eyes, feeble posture of hands, fidgety and restless, showing nerve irritability. Improves during lessons. Evidently not the school-work which produces the depression.

Often the "troublesome" children pointed out by the teacher, showed marked signs of exhaustion, irritability, or defect, indicating the need for rest, or change of system in teaching, or hours.

Of the cases above quoted, No. 8 would not suffer by compulsion, No. 10 should not be pressed—would do better with less work. Nos. 14 and 20 required complete rest, which would probably be sooner or later compelled by illness. No. 21 required enquiry into habits of life. Examples might be multiplied indefinitely of cases in which the knowledge what to look for and how to look for it would ensure suitable treatment.

is being used up, whether in regular and well-governed function, under the control of the will, or spasmodically and irregularly, showing over-stimulation or exhaustion.

The amount of energy daily supplied to a child in regular health and nutrition being a fairly constant quantity, and being normally used up between growth, exercise, and head work, an overdraft upon it must naturally be manifest somewhere. Now, as the "tone" of the body depends on the steady supply of healthy nervous energy, one of the first effects of overdraft upon its reserves is that this muscular tone is relaxed; not uniformly, but according to the kind of exhaustion. For instance, the head held persistently to one side indicates weakness of the opposite side; if thrown backwards, that the brain is irritated or over-stimulated. Restless eyes indicate some form of nervous irritability, the exact cause of which will probably be revealed by closer observation. Other indications of irregular discharge of nervous energy are fretfulness or "nervousness" (often the first sign of something wrong), ptomaine rash,* twitches, frequent blinking, spasmodic movements of one kind or another; while nervous exhaustion is shown by certain postures of the hand, and by the red and relaxed ears and the wrinkled brow, which are so frequently to be seen at the end of a school term. These are common signs of temporary overstrain on the way to become permanent, and may be due to very various causes, to be determined specially for each special case. In young children (7–10 years), too long hours, enforced quiet, over-study, digestive troubles often due to bolting food or to sluggish action of the bowels, are the usual causes. Among older boys, irregular demands on the secretory system, or stimulus of certain nerve-centres at critical periods of development, must be borne in mind as additional possibilities. Relaxed

* Small darkish spots on the skin, due to absorption of products of fermentation in the food unduly delayed in its passage through the intestines.

muscle round the eyes, and bending forward at the loins, lounging attitudes in walking, indicate malnutrition, whether from defective supply of food, want of assimilative power, disordered digestion, or vicious courses. The scale of food supply in schools for the children of the upper middle class may be assumed to be good and sufficient, but nevertheless cases of distinct malnutrition may often be seen, certainly arising from the frequent eating of sweets and "tuck" at odd hours, to the neglect of regular meals, a matter which some mothers habitually encourage.

All the states above described are caused by defective or misdirected nervous flow, and if the conditions which produce them are prolonged, they will become permanent. Where they exist, scientific tests of the acuteness of the senses will reveal that these are dulled, and though sights and sounds may fall upon the eyes and ears of the exhausted, ill-nourished, or congenitally defective child, he does not effectively see or hear, and therefore, of course, his lessons never reach his brain at all. He is, in fact, more or less advanced towards the torpor of the quails, which, after the excessive demands on their nervous power of their flight across the Mediterranean, land on the coast unable to see or hear, and may be taken with the hand. It is probable that a very considerable amount of apparent intellectual difference is really difference in quickness of sensory reaction. If ideas are presented too fast for the brain, none are completely formed, and therefore none can be remembered. Therefore no course can be more cruelly futile than the attempt to teach, to press, or to stimulate tired children. Far more progress is made in four hours of full alertness than in seven hours of constrained attention; and each of the changes of expression should be as an open book, wherein the teacher may read with running eye the conditions of his little ones, and be sure when inattention deserves rebuke or punishment, when it is the result of physical and un-

avoidable causes, when it is the proof that his methods are ill-adapted to the average of his class, or when individual misdirection demands special treatment.*

This last case, of individual misdirection, is not an uncommon one among boys of twelve to sixteen years of age, and is perhaps more common among children of the middle classes than of the poor, who have less privacy. Wherever it exists to any serious extent the signs are observable, and when all the detail of work, sleep, diet, and exercise are known to be suitable, there is no great difficulty in verifying the facts.

4. The Causes of Overstrain. Overstrain is a relative term, and as there may be observed among children every gradation downwards through slow but just reaction, limited reaction, to dulness and mental deficiency, and upwards from quick inaccurate perception and unretentiveness, quick and accurate reaction, to that mental grasp which constitutes talent, it is clear that no hard and fast rule can be laid down. A child quite free from developmental defects, but slow in reaction from hereditary causes, may be overstrained by a rate of progress which is insufficient to arouse the full effort of the talented boy; and there are special abilities for mathematics, literature, or arts also to be taken account of.

But, broadly speaking, there is a *régime* which is fitted to the normal or average boy, and when overstrain or over-pressure is spoken of, it means the pressure which overstrains this average boy who shows little or no developmental defect. To such children the chief causes of overstrain are :—

(1.) *Under-feeding or wrong feeding.* This is common in primary schools, where undersized and pale children

* This seeing eye is one of the first essentials of a good teacher. A boy becomes sometimes an inveterate buffoon and idler in class, solely because possessed with the idea that school studies have no permanent use in the world.

show plainly enough that they have no energy to spare for brain work. Whether free meals pauperise parents and encourage improvidence, or whether parents would not willingly supply the 1½d. a day which recent experiments both in London and Vienna have shown to suffice (with good management) to give the children a good breakfast before beginning work, is not here the question; the point is, that to attempt to teach hungry children is a fore-doomed failure, and a dead waste of the whole expensive educational machinery.

Wrong feeding, leading to disordered digestion and irregular natural function, is common in all classes, especially among the wealthy. If digestion is disordered, the whole flow of power is impeded at its source. In a thoroughly healthy child the hours of food and of natural calls should be as regular as clockwork, and can generally be made so if parents will help.

(2.) *Unwholesome surroundings.* The purpose of hygienic precautions is, briefly, that the organism shall not be called upon to waste effort in the endeavour to counteract or overcome morbific influences. We cannot guard against the thousands of germs which we daily breathe, eat, and drink, but the healthy body has its own means for disposing of these and rendering them harmless. When, however, bad drainage, damp or insufficient clothing, confined rooms, want of light, contaminated water, &c., &c., pour in the adverse influences by millions, or create unreasonable demands on bodily heat, then the draft upon the energies may be such as to leave little available for other purposes, and these demands may be the instruments of overstrain. The boy or man who lives in the open air, and does little or no brainwork, can endure conditions of life which would speedily produce disease among brain-workers.

(3.) *Vicious courses.* The nerves which supply the lumbar and sacral regions are particularly large, manifold, and sensitive, and are peculiarly excitable through all the

senses, in youth specially so. The fact may be regretted, but it should not be blinked, and medical testimony is reliable and abundant to the very wide-spread evils which originate here. A medical man of large experience in training boys told me not long since that he had reason to think that eighty per cent. of boys indulge more or less in sexual malpractices. This bears out my own observations, and there can be little doubt that this accounts for many "failures." Not only are the growing energies drained, but a perverted growth is set up which has a peculiarly and distinctively deadening effect on healthy mental interests, and must inevitably lead both to a low standard of attainment, and to the nervous overstrain which precedes failure to endure the stress of life and may ultimately cast out of existence him that persistently offends.*

(4.) *Insufficient sleep.* Dr. Clement Dukes, physician to Rugby School, gives—age five to six, 13½ hours, gradually diminished to 11 hours at ten years of age, reduced to 10 hours at twelve to fourteen years of age, and subsequently 8½ hours sleep.

* Some former remarks have been met by the criticism that it is difficult to suggest any practical remedy for a state of things which has been often admitted. I therefore mention the good results which have attended the following measures :—(1) A clear and interesting lecture on the nerve force and the machinery of growth, with electrical experiments such as the contraction of a solenoid to show the contraction of muscle, under an invisible but measurable current of energy used up in the process ; with good physiological diagrams, the drift of the lecture being economy and waste of power. (2) Direct appeal to boys that they are casting away their hope of strength, manliness, usefulness and respect, accompanied (in cases where there can be no doubt of the need of the object lesson) by a visit to an epileptic asylum. (3) Wise and kindly advice, given without reprobation or disgust, on the control of the will. (4) The frequent reminder that religion is the daily life as actually lived, and that physical consequences are the appointed and unavoidable wardens of God's laws, whose vigilance no supplication can turn aside. It is the artificial separation between the sacred and the secular, between physical and moral, between scientific and religious, that is accountable for want of hold of much true and good advice.

(5.) *Over-study.* This is one of the commonest causes of overstrain. Hours are generally from 30 to 75 per cent. too long. Mr. Caulfield, B.A., a scholar of Wadham College, Oxford, and an exhibitioner of Rugby School, gives (*Public Schools and Scientific Education*) the following as a typical time-table in a large Public School :—

7·0 — 8·0	A.M.	First School followed by Chapel.
9.15—10.45	„	Second School.
11·0 —12.30	P.M.	Third School.
12.30— 1.15	„	Extra lessons.
4.15— 5.10	„	Fourth lesson.
5.15— 6.15	„	Fifth lesson.
7·0 —10·0	„	Preparation.

After deduction for half holidays and for time spent in the evening otherwise than in preparation, and taking no account of impositions, music, extra work in preparing for examinations and the like, there remains an average of some 7 hours a day. This is in flat defiance of the reiterated demand of medical authorities that children's hours of work should not exceed a maximum of four-and-a-half to five hours. In most public schools (*vide Public Schools' Year Book*) the hours in school for junior forms run to about 26 or 27 per week, but this is of course exclusive of two or more hours a day for preparation, and takes no account of "extra subjects." Deducting two half holidays, the daily hours amount to about 6½ hours, and this represents the hours usual at preparatory schools also, until an examination looms near, when preparation and coaching may extend to 12 or even 14 hours. I know many preparatory schools where the regular hours, including preparation, exceed seven hours a day for quite young children.

(6.) *Unscientific Teaching.* The two commonest complaints of parents with regard to their children's instruction is that they are overworked, and that they do not learn enough. Nor are these objections mutually self-destructive.

As long as many precious hours are devoted to "hearing lessons" instead of teaching, long hours are an unavoidable necessity. But besides this, the effort to translate into real ideas abstract words out of books which have no correspondence with any of the child's own experiences, or the more usual endeavour to remember the words irrespective of any idea at all, is a mental effort which will account for many things besides the overstrain of which it is a fruitful cause. This, however, will be dealt with at length in the next chapter, and need receive no further treatment here.

Any or all of the above causes may produce the want of balance between in-come and out-put of energy, which is manifest first as spasmodic irritability or dull weariness, and afterwards as nervous exhaustion, and each and all of them have their appropriate signs in outward physical movement and expression, signs with which every person who dares undertake the teaching of children should have been trained to observe.

These are the causes of overstrain, and inasmuch as they are verifiable and active causes, to state them is to imply their remedies. These are :—

(1.) Hygienic surroundings, that the growing organism shall not be retarded by having to struggle against adverse influences.

(2.) Healthy bodily habits, the establishment of the regular cycle of nutrition, exercise, and rest, special attention being paid to the regularity of the digestive process.*

* This is so important that I make no apology for repeating here what I have said elsewhere :—

"Now boys are often *told* to retire at a regular hour, but no provision is made for their doing so. It is a fact that children will not leave their play to attend to the calls of nature if they can help it. They will go constipated for days, because in playtime they are too absorbed to feel the need, and masters are rightly reluctant to allow . . boys to leave class . . therefore let there be a vacant half hour after breakfast and the requisite facilities."—*Foundations of Success*, p. 52.

(3.) Moderate hours of brainwork, rising gradually from 4½ hours at eight years old to 7 hours at sixteen years, and no evening work in the earlier years.

(4.) Instruction adapted to age and arranged in regular sequence; in fact, definite courses, leading by the natural development of the brain from primary sense perceptions to generalized knowledge.

(5.) Plenty of physical exercise—preferably games, but in special cases supplemented by special gymnastic for the cure of particular defects.

These conditions are those of the wholesome economy of nervous power, and this economy is the condition of a higher civilization. In that struggle for existence which never ceases there comes a time when the early physical competition gives way to mental competition. The severity of the training for a high condition of civilization imposes the condition that those who are to succeed in maintaining their position shall economise their energy by living wholesome and intelligent lives. This marks the transition from a physical to an ethical struggle for existence. These physical and mental habits should be begun at a very early age, for in bodily life the physical and the mental are intertwined so closely, that the physical state of a child not only reacts on his mental state so much that it may often be said to be its cause, but reveals what line of development or degeneration it is following.

I have no hesitation in saying that a health report, giving, not opinions, but the actual facts which are the basis for opinions, in Dr. Warner's or some other simple form, should be sent to parents, together with those interesting documents in which the personal equation of the form master bulks so largely: they would be welcomed by those parents who desire to have reliable data for their watchfulness, and for a forecast for the future of their sons.

But whether or not this course would be welcome to the average British parent, it is certain that such observations

are most valuable to the master who wishes to do the best, not merely for his school as a whole, but for his boys singly, and desires to base his educational work on some surer foundation than that journeyman's "experience," which is so constantly appealed to, in happy disregard of failures, and in vindication of the most opposite practices. This "experience" is, at its best, necessarily the more or less limited conclusions of one member of a profession which we must sorrowfully admit to be, on account of its demands on energy and patience, and of its temptations to autocracy, perhaps the most narrowing in the world; and, at its worst, is the arrogant disregard of all the carefully tested and exactly worded experience of qualified observers which constitutes scientific knowledge.

Chapter III.

MENTAL ECONOMICS.

"The leading principles embodied in the Kindergarten method of education may be stated as follows :—(1) That education means the development of all the powers of the child; (2) that, in the process of education, the development of the bodily, as well as of the mental, faculties is to be aimed at; (3) that education is essentially defective if it fails to cultivate the moral sense; (4) *that what is spontaneous in the child is the really valuable part of the process of education, so that the aim of the teacher should be, not so much to give the child instruction* ab extra, *as to supply materials and opportunities for the mind of the child itself to work upon;* (5) that these materials and opportunities should be supplied in a well-considered harmonious order, each step in the process of education being naturally led up to by what preceded it; (6) that, as far as possible, the process should be adapted to the disposition, capacity, and actual development of each individual child. . . . As regards the National Schools generally, we recommend that the instruction of infants,—that is, roughly speaking, of children under seven years of age,—should approximate as nearly to the Kindergarten ideal as the circumstances of the case will permit. This approximation can, of course, more easily be effected in schools where the children under seven are sufficiently numerous to form a class, or a department, by themselves, under the charge of a special teacher or special staff of teachers. In such cases, we are decidedly of opinion that the education of these children, so far from consisting exclusively of instruction in the "three R's," should never begin with such instruction, but should, at first, be of a purely Kindergarten character, and should continue throughout to consist largely of Kindergarten exercises."—*Final Report of Commissioners, Parliamentary Paper, c.* 8923 *of* 1898.

1. Essentials of Method. The gardener who desires to obtain the best possible results for a seedling is well aware that its perfection at maturity will depend on the early stages having been passed through slowly, without check and without forcing. Any conditions which hasten the flowering before root, stem, and leaf are fully grown, inevitably result in a lower development than might have been

reached. The plant needs space, time, and rest; it grows by regular nutrition supplied to it in quantities no greater than it can use day by day, and by the steady function of all its parts reacting to the stimulus of outer Nature—of sun, rain, and wind.

The greatest educational reformer of this century, who reduced to systematic practice what others had merely theorised upon, is chiefly known by the inspiration which led him to see that neither the sedulous protection of the forcing-house, nor the unmitigated competition of the hill-side, but the air of the garden, is the type of the atmosphere for the child. Space, time, and rest are his demand for the human plant, which needs them alike for body and mind, and never perhaps has this need been more felt than in the present time of over-pressure. His "Kindergarten" is a garden of children, wherein, supplied with fit material for mental and physical growth, reacting to healthy stimulus, and given free play to exercise all faculty, our sons may grow up as the young plants, growing healthily by doing wisely, and confirming habits begun by wholesome surroundings. That the child, like the plant, should grow by the exercise of healthy function, is Froebel's aim alike for the physical growth by unconscious and vegetative reaction, and for the mental growth by intelligence and energy consciously exercised on outer things. To reach this end he "teaches" scarcely anything:* he inculcates no maxims,

* For this reason nothing is easier than to travesty the Kindergarten, and turn it into a day nursery where every principle of education is ignored. There are scores of "Kinder-gartens" which have nothing of the kindergarten but the name. Even "the educational public are still inclined to regard a long list of games and occupations as the chief addition which F. Froebel has made to the cause of education. Doubtless a few of his leading theories have been set forth in our language, but they have not as yet much practical influence on the organisation of Kindergartens and Infant Schools. Theory and practice stand aloof from one another. Popular attention is mainly concerned with the various Kindergarten toys and games. To meet the demands, manuals on these subjects have been multiplied amongst us. Manuals on the occupations . . are apt to waste

he gives no conclusions, he seeks to impose no external will upon the little ones, and limits discipline to the enforcement of orderly social intercourse, and punishment to the penalties for wilful wrong-doing. But he presents to the children colours, shapes, and properties; well-defined and unyielding forms; parts and multiples of similar shape for putting together and taking apart; the elements of flat form which are the material of future geometry; the lines and joints by which distance and position are realized, and of which letters are made up; paper and pencil wherewith to reproduce in symbol the thing seen; material on which to exercise ingenuity in cutting and shaping, in braiding, weaving, and building, in modelling and reproducing in miniature the things of the child's own experience and fancy.*

What can be done with these things, how interesting their uses, how various their results, the wise kindergartner will show, but will not compel the child to learn, trusting, and abundantly finding, that the new interests will joyfully be welcomed and the uses eagerly discovered. No idle wind of didactic verbiage defining form, colour, number, size, and position already appreciated by the senses, disturbs the healthy natural process of familiarity with the things themselves, by which the genuine notions of these things are formed in the growing mind; the children are brought by a planned order into contact with the real first principles as they are able to bear them and use them,

the student's time, because they prescribe an amount of unmeaning work, not in accordance with the educational purpose to be served. . . The Kindergarten has often degenerated, even in the country of its origin [Germany], into a place where children are pleasantly amused, folding paper, playing games, &c.; and English people may be excused if some misconceptions concerning the aim and object of the institution are still dominant amongst them."—*Parliamentary Paper, c.* 8923 *of* 1898.

* Messrs. Philips' sequence of gifts from the first to the twentieth affords full scope for the exercise of these activities. If each be used to the full, not tossed aside as soon as the first novelty has worn off, ideas of number, shape, size, colour and relation, grow with the child's growth.

and the healthy reaction follows of itself; the child draws its own conclusions, by contact with its own facts, and is never compelled unnaturally to remember the conscious analysis of an older mind and a later stage of development, which it nevertheless perceives as existing, and to which it will often turn for help.

"The superficial observer sees in a Kindergarten a little simple material, a few squares of paper, being handled by happy babies of four, five, or six years of age; he sees them marching, singing, playing games, modelling in clay and sand—that is all. The educator says—that is enough, for he sees how much the children are gaining under the guidance of a skilful teacher. He sees the essential elements of education at work here; he sees the little ones trained in habits of order, neatness, exactness; he sees them encouraged to be industrious and persevering; he sees that their physical powers are carefully developed by speech exercise, singing, marching, and games; he sees that neither the cultivation of the imagination nor the training of the memory are neglected; nor anything in fact that tends to the harmonious development of the whole being. This is the reason why, in spite of the wide-spread ignorance of Froebel's principles which still prevails, the system is readily gaining ground, although the principles which underlie the games, gifts, and occupations are often wholly disregarded. So long as the children are under seven years of age, and go to a genuine Kindergarten, they find in it a life in which everything that makes up real living is provided for. Up to this stage Froebel worked out his ideas; but he has left us to find the application of his principles for older children, to select the occupations and the subjects of intellectual, moral, and physical training which shall replace the Kindergarten life."*

* Miss Emily Lord in *Essential Elements of Education*, quoted by Mr. George Ricks, Inspector of Schools, London School Board.

An excellent and most readable summary of Froebel's work is *The Student's Froebel.* W. H. Hereford (Isbister).

Space, time, and rest; contact, not with books, but with things; experiences, and leisure to reflect upon and to grasp them; the steady growth in planned order from small beginnings. Can anything be more at variance with the system into which our children are plunged on "going to school?" But the minds are the same as those which unfold in the Kindergarten: it is only the system which differs; and the singularly high standard of intelligence and attainment in the genuine Kindergarten, and the healthy happy demeanour of the children there, are proof enough that suitable acquirement is no unhealthy strain. The curves of growth bear out this experience, and make it clear that if regular teaching at eight years old produces over-strain, it is the method which is at fault. This indeed should need no proof. Such of us as may ever have taken an interest in any art, science, historical or family record, or in any other intellectual pursuit for its own sake, are well aware how little strain is felt in pursuing an interesting study. The attainment is its own reward; the hours we give to it seem all too short, and end in the healthy fatigue relieved by the sense of achievement which looks forward to the next conquest. With an uncongenial, though perhaps easier task, how great is the contrast. Transfer this to the child. We set him down to learn lessons which do not awaken his interests; to remember, under penalty, words which do not recall any experience which he has had, nor refer any matters akin to his daily life, and then reprove a weariness that leads to inattention which we in like case would speedily seek to justify. The result is often, or even generally, a growing dissociation of lessons from all actuality; interest is killed, and "work" becomes the retention of an encyclopædic farrago of information about the Latin sentence, kings and battles, French verbs, the properties of triangles, &c., to be got through as soon as possible, and in self-defence to be forgotten the moment lessons are over, in the real interests of the playing fields or the story-book.

In short, the will is not bent to the task in hand, and discipline is often called in to make up for the lack of interest. But the appointed and natural means of directing the will is through the interests, and these cannot be aroused with a cane.* They are aroused by contact with things themselves as opposed to talk about things, by appealing to the brain through eye, ear, and hand, and not by mere words; and till they are aroused there is no real progress because no natural mental action.

If, then, the problem whose solution we seek has been correctly stated as the economy of mental power, the first step here, as in any other dynamical problem, is to find a sound method—one which arouses the interests of healthy children. This Froebel has shown us. It is to arrange our matter in an order which suits both the growth of the child and the sequence of the study; so to order our manner of teaching that each lesson is really a stepping-stone to the next, and capable of practical application; neither to set tasks for "preparation" and "hearing," nor to lecture, but to present as far as may be the things themselves, or visible representations of them, with just so much guidance as is necessary to get the children to dismiss irrelevant points and to find out and associate the essential ones; to

* That there are some intelligent and conceited children who will make no sustained effort, and whose attention can only be awakened through their skins, is no doubt true, but these are a small minority. And that all children require discipline, and occasionally punishment, is of course not denied. Sooner or later each of us comes to a wall which we must get over or through, or remain captives of circumstances all our lives; and the sooner this habit of resolutely addressing oneself to the task in hand is developed the better. But in the normal child this habit can be developed through the interests better and more genuinely than through the integument; the results of the latter stimulus being apt to disappear when the fear of the rod is withdrawn! Discipline finds its legitimate function in enforcing, not interest in words understood little or not at all, but thoroughly good work up to the capacity of the child. Till a child understands that he must address himself with a will to that which he undertakes, no progress can possibly be made; and the discipline which, if needful, compels this, is the very first condition of progress.

make them discover and formulate their discoveries; whenever possible to apply to practical use what has been so wrought into the mental fabric; and, chiefest of all, to insist on each child doing the very best work it is able to do.

2. Adaptation to Stages of Mental Growth. 'Method,' then, covers both the science of instruction and the art of teaching, and must be based on the order of development of children's minds as the years go on. Instruction, to be scientific (*i.e.*, to be exact and effective), must first of all conform to the successive phases of healthy growth; and the test that it does so is whether or not the interests of the normal child are aroused.

Philosophers, perceiving that there can be but one law of life, have insisted that no stage of development in its turn and order is evil. There is no definable intellectual standard of excellence for child or man, but each successive stage of growth is a part of that progress from the lower to the higher which is the method by which the Eternal Spirit of God brings good out of what we call evil, and subdues all things to itself, not by miraculous cataclysm, but by vital process, and directs the evolving world to

> " . . the one, far-off, divine event
> Towards which the whole creation moves."

They have pointed out that a perfect world could not be created, for if devoid of the limitations which are felt as evils it would be pure spirit; but that it must be developed, for growth itself is change, and each better implies a preceding worse, and even depends upon it.

But, assenting to these high reflections, we teachers are apt to forget that every truth must be applied and made fruitful in the work-a-day world, and that these truths are the real basis of our work. Methods of instruction have not been and still are not evolutionary, but aim rather at the inculcation of final facts. We do not educe, draw out, exercise, and enlarge the perceptions by dealing with

original material in order to enable the child to enter into true relations with his fellows and his surroundings, and so pass through each stage of a normal development, but, on the contrary, endeavour to fill him with the conclusions of other minds, as information, precepts, and rules. Very little attempt has been made in England to use psychological discoveries in the great work of directing the interests and the impulses of those who in a few short years will be the Anglo-Saxon nation, and on whom its splendid heritage will devolve.

Froebel insisted, concurrently with Goethe and fifty years before Herbert Spencer, on the necessity, clearly seen by all truth-lovers, that each mental stage as well as each physical one should and must be passed through in its completeness, in order that the later stages should be completely possible in their turn.

But instead of pondering in solitude on what children should be taught according to the intellectual and religious standard of his day, he proceeded, by observation of the children themselves, to discover what are the actual interests and capacities at their several ages, in order to adapt instruction to those interests and capacities. The Kindergarten gifts depend upon this for their meaning and value. They supply primary percepts of the colours, shapes, and sizes of things, of their relative positions, of the tangible support they give to one another in a building or fabric, and these are the necessary foundation for all after knowledge, and are here presented in a systematic way, instead of being picked up at random and haphazard. At the age for which they were designed—between three and seven years —there is as yet no attempt at classification, still less of abstract notions, as of red apart from red things, of transparency apart from transparent things, of strength apart from strong things, and so on.

He well knew that the early interests are bound in material and concrete things, and that to give abstract

ideas gratis and teach them as words, in place of letting them be learned by the natural process of the mind, is actually to cultivate that wide-spread habit of intellectual mendicancy which clothes the mind in rags and shreds of other men's thoughts and conclusions, and substitutes words for real experiences, whether physical or mental. Therefore the "gifts" are admirably adapted to the years in question. The principle of instruction is that of thorough understanding of, and familiarity with, original material suited to this stage of mental growth, and the same principle must guide the instruction of the next stage beyond the Kindergarten.

Much further child-study is now being undertaken with the object of verifying the mental stages in detail. A comparison of the first ideas and drawings of children with those of primitive peoples, for instance, shows a remarkable resemblance between them. As the Indian uses picture-writing, which is by no means an attempt to represent things as they are seen, but to depict them by symbols, so the child also draws a sign for what it sees. The circle for the head, dots for eyes, strokes for arms and legs, and an indeterminate number of radii for hands, are attempts to represent the roundness, length, and number which are to the child the first ideas attaching to the notion of head, limbs, and hands. This has been developed at length by Herbart and by others,* who have shown how close is the analogy between the growing perceptions of what events are historically important in the nation and in the child. Further child-study will give that accurate knowledge of the early stages of the sequence of mental development

* For an interesting study on "The Historic sense among Children" *see* Nos. I., II., III. of *Studies in Education.* Edited by Prof. Earl Barnes, Professor of Education in Leland Stanford Junior University, California: giving the percentage by diagrams, the development of inference (legitimate, critical, and imaginative), of value attached to hearsay, of value attached to documents, among children according to age.

which must be known before instruction can really be scientifically adapted to the minds for which it is intended. The departure is momentous, for it means that we have at least begun to take practical note of the existence of a law of growth.

The broad results work out somewhat as under:— After the Kindergarten stage, about the seventh year, synchronizing with the falling off of the great demands of bodily growth, and lasting till about the 12th year, there sets in a desire to collect, to classify, and to know, to form genera by likenesses and differences. In this second stage of intellectual development the basis is still physical perception of concrete things. The reports of the senses are absolute, and when translated into words, each word has an absolute and literal value. The classification of stamps, crests, shells, birds' eggs, flowers, and other objects of the outer world, are by their purely physical properties of colour, form, and kind—not by any of the less apparent reasons on which scientific classification is founded; and, again, the attempt to give this in advance of the mental demand is to turn the pleasure into a grief, and to ensure rejection of the teaching. The interest is not yet analytical, it does not concern itself with the nature of things, and is not keenly aroused by description of things apart from their personal uses.

Similarly the child's human interests are personal: tales of wonder and adventure, of myths and exploits, crude, primary, and unqualified by veridical circumstances, the victories of the champion who slays thousands single-handed, the personal doings of warrior and wise man told in saga and folk-tale,—all these awaken his interest, and as with the kindergarten gifts wherewith he geometrizes by the mere handling of form, having never heard of geometry, so here, given the material of history, he learns without knowing that he is learning, he deals with the material after his own fashion, and forms concepts all the more

definite that his mind is centred objectively on things which have not yet become the counted possessions of self-consciousness.

These facts indicate both the Humanist and Realist instruction suitable during the years from 8 to 12. It is the concrete and the personal, with a visible classification added, but of which he is told nothing; a principle according to which objects fall naturally into order, and have a purpose, seen dimly indeed, but sufficiently to anticipate the frequent objection of the candid youngster that he sees no use in what he is called upon to learn.

His Arithmetic, Geometry, Physics, and Geography should all be concrete, not abstract: dealing with the computing, measuring, weighing, and representing of visible, tangible realities first; and with figures, diagrams, descriptions, and maps afterwards, because such instruction gives a real basis of first-hand knowledge. In his historical study, the dress, ornament, food, houses, temples, rites, modes of warfare, and tribal customs, exploits of heroes and folk-tales, are the natural material wherewith are formed the mind-pictures which are to represent the type in the mind, and to call up the associations to be awakened by the names of Celt, Roman, Saxon, Dane, and Norman.

But this second stage of mental instruction is not play, it is accurate, careful work. Froebel indeed rightly said that up to about seven years old all work should be play, thereby implying that then serious work should begin; a conclusion which is borne out by physiology and by experience. There is an attempt being made to turn all work into play, to teach arithmetic by games of cards, history by loto, geography by puzzles, and language by dramatic dialogues. Some of these, especially the last, can be used, and in so far as any are effective in arousing interest they are good. Children in the mass are the unerring jury in this matter. But their majority verdict is adverse. They quite appreciate the difference between play and work, and

resent the attempt to identify them. They are quite able to feel the satisfaction of intellectual conquest, and quite willing to undertake an effort for it. To base a system of instruction on children's momentary preferences is the *reductio ad absurdum* of sound psychological principle, and this is the Scylla to the Charybdis of rote-learning.*

As the accumulating mass of sense impressions of the young child developed the notions of hard things, heavy things, bright things, and these again grew into ideas of objects or stuffs with names, such as steel, lead, gold, glass, round which centre the ideas of hardness, heaviness, brightness, transparency; so in the next mental period (which may be set at from 12 to 15 years) an order is gradually perceived in the crowd of objects which in their turn duly fall into classes and categories. Interest is gradually transferred from objects to the forces which made them what they are, and the classification of material as affected by force follows naturally. In this period the likenesses and differences of plants become systematic botany; things under their relations of number and force are abstracted into mathematics, under aspects of mass, appearance, and mutual reaction into physics and chemistry; relations of form and area develop into geometry, and a distinct pleasure is found in analyzing the properties of things which underlie, and are often contrary to, the obvious sense impressions which they produce.

Concurrently and naturally arises the perception that words have little absolute value, but are related to what is already known by the speaker; and this discovery harmonizes with the desire to realize what others have felt and thought in times past. In this phase the real interest in

* A great danger lies before some advocates for making all lessons pleasant to the child—the danger that they may foster a habit of flabby reluctance to follow up any study over and through its first real difficulties, a habit of yielding to obstacles and enfeeblement of the will. The remedy lies in insistance on thoroughly good work up to the measure of the child's powers.

history, which comes of a stocked imagination, is now possible, and the use for the material already given is now for the first time apparent, and as the child entering upon the trials of adolescence succeeds to its human heritage of temptation and power, of struggle and victory, it is able to understand the motives and desires without which history is a mere mass of dry-as-dust names and dates.

How can a child of twelve apprehend, much less realize, the instinct of the strong and brave to establish order and government, the personal ambitions of small men born to great place, the passions and desires which pervert justice, and the discernment and steadfastness which uphold it, until it has consciously felt similar impulses?* And when the capacity to understand history has grown, the material should be already to hand; the child should not have to collect this and to use it at one and the same time. He should be already familiar with the images of some of the actors and with some of the scenes of the human drama, nor need to learn of the actors as well as of their actions. But the child who has realized Celtic dress, weapons, laws, customs, and warfarings, and contrasted these with their Roman, Norse, and Teutonic analogues, has already understood something of the human hopes, desires, and ideals which are associated with each of these names, and has material to use and compare which will be a clue to all history. In the third period (15 to 18), after interest has been transferred from things to the forces which made them, the stored imagination turns to collective and national rather than to individual action, and holds a clue to what had otherwise been the involved drama and the confused issues of history.

The Humanist interests for the average boy of fifteen

* Yet this is the age at which the tangled skein of English political history is usually set before a boy. At one great public school I know all instruction in English history ceases with the IV. form, for many if not for all boys.

will often quite overshadow both the physical and natural sciences (now becoming more and more abstract) as well as the personal interest of the previous stage. Henceforth causes are felt to be greater than men, and men than their surroundings, and all that he should then need is guidance in his historical reading.

3. Adaptation to Sequence of Subject-matter. But if the growth of the mind compels an arrangement of the subject-matter, and a manner of teaching conformable to that growth, under penalty that all matter otherwise presented shall incontinently be forgotten, not less imperative is the objective sequence which leads step by step from first principles to more complete knowledge and culture.

As regards culture and taste, this sequence is difficult to conform to, but as regards knowledge it is easy. In some degree it has necessarily always been followed, though it is often or even generally marred by reason of a misapprehension of what "first principles" really are. I take from my shelves at random three school text-books. The first (*a*), on Mechanics, gives series of definitions of Force, Rotation, Gravitation-units, Statics and Kinetics, Action and Reaction, Conditions of Equilibrium, &c. The second (*b*), on Geography, defines the form of the terrestrial sphere, latitude and longitude, and the movements of the solar system. The third (*c*), on Algebra, declares it to be a science of abstract reasoning by symbols; defines products, factors, co-efficients, powers, indices, exponents, &c., &c. All these presuppose a certain familiarity with the order of ideas in question, and the form of each of these books is determined by the attitude of the writer that he is about to impart that which he has acquired. I make bold to say that none of these are first principles at all from an educator's point of view. They are either (*a*) highly abstract generalizations from an enormous mass of experiment, apart from which they are scarcely to be understood; (*b*) inferences from a

great body of facts which are remote from or opposed to ordinary perceptions, and were only discovered after centuries of research and exploration; or (*c*) conventions which should not be introduced at all till the need for them arises.*

All knowledge is in minds, and not in books, and in minds it passes through two main stages, the Inductive and the Deductive. These two are halves of one process, and the former precedes the latter in the national growth of sciences, and should likewise precede it in the individual mind. The mass of separate facts is classified by a natural mental process of induction, for the most part unconscious: definitions are then framed, and a more or less complete theory is built up, which is then applied deductively to fit and explain the facts, and remains good and current so long, and only so long, as no new facts are discovered which do not fall within it. When such facts come to light, as they always will, theories are extended, modified, or abandoned, but the process is still the same, and the body of science is still quite unaltered. When the theory is quite unassailable, and can, as in the case of Geometry, be reduced to definitions, these become the starting point of a formal or exact science, which posits definitions and axioms, and deduces all its results therefrom. But no theory, however unassailable, and no definition however exact, can become the "first principles" of knowledge for a child. To split the process in half and present to its growing mind the second, difficult, deductive half without the first easy inductive half, by which in point of fact it grew, and to start, while he is yet quite ignorant of the whole order of ideas dealt with, from definitions, general laws, or exhaustive conclusions, as if these were the points of origin, is to make learning a pain and grief to him, and often, even when successful, to convert the free and inalienable heritage of personal experience into mere perishable hoards of memory.

* *Cf.* Herbert Spencer, *Education, or First Principles in Instruction.*

All knowledge properly so called is first-hand knowledge—the correct statement of the perceptions of the senses and of the intellect. Second-hand knowledge, of the recorded perceptions of others, classed according to the nature of such perceptions as History, Science, and Mathematics, becomes assimilated (and thus in its turn genuine knowledge) by means of typical personal experiences similar in kind to those recorded perceptions. Hence "first principles" for children must always be those which give rise to the classification, and therefore involve the facts which are common to all phenomena of each kind. Not the generalization reached by much thought and comparison of particular cases is the starting point of schoolroom science, but the particular cases themselves, and the difference between the path of learning and the path of discovery is, that whereas the latter proceeds in its earlier stages (before a theory has been formed) by mere trial and error, and very much in the dark, the latter can proceed by typical examples in a definite order, which loses no time in by-paths and blind alleys, while taking all the steps needed by the reasoning.

The elementary facts of Geography are Direction, Distance and Level. An English child who does not know that all shadows point due north at noon, and that all places on the earth are referable to this direction, has no real grasp of the meaning of longitude, however thoroughly he may have learned its definition. Level above the sea, the nature of soils and the properties of water, are the elements of Physical geography; and distance with reference to available means of locomotion and physical features are the essential factors which convert physical into Commercial or Political geography, which should therefore always follow (instead of preceding) the former.

The first principles of Arithmetic depend on the immutable facts that its only possible physical operations are the acts of putting together and separating groups of like kind,

and the writing down the symbols for these acts. When the groups are unequal, the process is Addition; when equal, it becomes the repetition of the original group so many times, or Multiplication. Subtraction is the separation of one group from another, large or small; and Division is the separation of one large group into equal smaller ones, the dividend being the mass or number to be divided, the divisor the number of groups into which it is to be severed, and the quotient the number of units in each group, or *mutatis mutandis*. From these facts, and the symbols which express them, all arithmetical "rules" take their origin, and to these they are easily reducible until the necessity for any reduction to primary perceptions is passed. The mental equipment which perceives these relations of numbers is not taught—it is innate; but it develops, like any other, by practice, not in book "arithmetic," but in performing these operations.

The first principles of Geometry are our concepts of length, area, and solidity applied to various regular forms. These are in due time perceived to have relations to one another, and the notion of proportionate magnitude is developed.

The first principles of Physics are those sensations whereby we distinguish objects as of various colours, shapes, and sizes, as bright or dull, transparent or opaque, crystalline, amorphous, powdery, fibrous, cellular, &c.; as hard, soft, stiff, pliable, strong, weak, elastic, plastic, heavy, light, hot, cold, moving, or still; as sweet, sour, bitter, acrid, pungent, fragrant, aromatic; as sonorous, musical, or noisy.*

The first principles of Grammar are the correlation of the word to the thing, quality, action, or emotion.

* That these "properties," apparently objective, are really subjective, need give us no concern. For if, broadly speaking, our senses do not inform us truly, then all thought is baseless, and there is no ground whatever for reasoning on the material world.

The first principles of History are two-fold: (1) Those which respond to purely intellectual needs, and (2) those which are essentially ethical or philosophic in their revelations.

The first deals exclusively with race likenesses and differences. A child who has not a clear idea of the leading types of European History can never have an intelligent grasp of his subject, however definitely and accurately his memory may register names and dates. This principle underlies all those matters of social custom and ethnology by means of which alone any given race is recognizable. The Celtic, Teutonic, Greek, and Roman races must be shown as distinct types, (1) in their physical appearance, (2) in their works, (3) in their pleasures, (4) in their ideas of right and wrong as revealed in the formulations of their priesthoods compared with the actual usages of their respective societies. Fortunately for our purpose, the young child, eager for material wherewith to stock a blank imagination, is fascinated by minute details infinitely wearisome to the adult intelligence. He assimilates readily the ideas given by familiar acquaintance with the buildings, weapons, household furniture, clothing, ornament, and art of primitive peoples.

To the second belong all considerations of a social order resulting from the union or balance of the peculiar powers of each race. Here both the subject-matter and the method of its presentment must respond to a purely ethical desire for dignity and coherence in the scheme of things which is observable even in quite young children.

All subsequent knowledge should grow up out of these two classes of first principles, and in the measure in which it does so will it become physiologically part of the mind, each nerve-path in the maze of ideas having orderly relation to others, and each more complex notion and image growing naturally out of the preceding simpler ones.

4. Teaching Steps and "Method-Units." The psychological facts above stated have long governed, more or less, the practice of successful teachers and the theory of educational reformers. Descartes long ago laid down the axiom, "Nihil in intellectu, nisi prius in sensu," now physiologically verified. Vixere fortes ante Agamemnon: but to Herbart is due the honour of developing these facts into the educational principle that elementary ideas grow out of the perceptions of the senses—that these elementary notions form "apperception masses" whereby the more complex facts are grasped and more complex notions are formed—and that every new fact is necessarily interpreted by the experiences we have individually passed through. Words have in fact no absolute value, but carry to each one of us meanings which depend solely upon our past experiences. If therefore words are to carry full, definite, and consistent meanings, these experiences must themselves be full, definite, and orderly; they then create "apperceiving ideas" to those which are to follow. Herbart's theory may be summed up somewhat after this manner:— Out of the primary perceptions which are common to all mankind there arise particular impressions which vary with the circumstances of each individual. When these experiences are given in a sequence which conforms both to the logic of the subject-matter and to the nature of the mind, this latter advances naturally from stage to stage, growing by its healthy function. To give typical physical and mental experiences in such a sequence, and by a method conformable to the stages of growth and to the laws of mental action, is the science of instruction* and the art of teaching.

Herbart calls each successive step a "method-whole" or "method-unit," each of these being the fact to be experienced, the event to be visualized, or the law to be

* Not of course of Education which includes discipline and guidance, physical and moral as well as mental, but of instruction.

discovered, as distinct from the "lesson," which should be a fixed period of time, longer or shorter according to the age and capacity of the child; and each set of these method-wholes are to be grouped so as to afford a mass of apperceiving ideas for the next stage to be passed through. The "method-whole" may be given in one lesson when the children are very young or the matter very simple, but will certainly extend to several lessons as the learners advance in age and the subject-matter becomes more complex. There is no need for the adoption of Herbart's diction by those who dislike anything German, and think that German discoveries of unwelcome natural laws are disposed of by the statement that there are anæmic children in Cologne; it will suffice to recognise the fact which he has so clearly put forward, that each step in instruction is definable, should be definite, and should serve to understand the next; and further, that each of these steps should be taken according to the natural mode of function of the mind.

This mode has often been stated, and has been developed at length by one of the present writers in Chapters VI. and VII. of a previous work. In the first and simpler stages of instruction, when the mind is busied with visible and tangible things, these are:—Observation of the fact presented; attention to the details which go to make up its *ensemble;* the association of these details into a connected whole; and the correct statement of the fact in the child's own language—the simpler the better—and not in words put into his mouth. In the later stages the actual, tangible facts will often be unpresentable; sometimes, as in historical matters, necessarily so; sometimes by reason of expense or inaccessibility; and the scientific, geographical, or mechanical fact has to be presented by words and diagrams only. In the case of grammatical, linguistic, and literary studies, the words themselves being the actualities, it is always possible to deal directly with them, but in all cases the

process is the same. If the theory of memory which was advanced in Chap. I. is correct, it is easy to see that this sequence of apperceiving ideas, and the "Law of Association of Ideas" of psychologists, are the association-pathways of the physiologist, and mean, in fact, the more or less complete revival of the cerebral nerve-currents which corresponded to or were evoked by the first and subsequent impressions. Observation and attention are exercised upon matter which is recalled by memory to "the imagination" before it is present to the mind. But in either case the mental operations are the same in kind, and the chief purpose served by each unit of instruction is to accustom the mind to go through these stages, which are the same for the child of eight as for the boy of fifteen, or for the adult man or woman.

Inasmuch as all healthy and truly sane life is continual healthy reaction to external influences of all kinds, this primary purpose of instruction very far exceeds in importance the secondary one of acquiring regular and systematized knowledge. But no one will deny the importance of this secondary purpose, and happily no sacrifice of the one to the other is needed. The latter is the means, the former is the end, an end which will be attained if the order in which the experiences are presented is that of their relation to the objective nature of the subject-matter. Not only must the induction be fully and fairly given, but the materials must be well chosen to develop its anatomy, building up one part from another till the presentment of the organic whole is complete. Above all, they must be simple and abundant, for it is by repetition of the same abstract truth in different concrete forms that it is really apprehended and retained. It would be quite possible to present admirable units of instruction, and to give very perfect individual lessons, which should even develop much interest and yet leave no permanent impression on the mind. A distinguished examiner in history and literature told me not long since that

he knew a schoolmaster who describes most vividly historical scenes, and keeps his class at a white heat of interest; but whose boys nevertheless seem to know less history each time that their knowledge is tested. Want of organic sequence and the lecturing habit will account for many such cases. These errors lead to the common misapprehension that oral teaching consists in "the masters learning the lessons and the boys hearing them," whereas good oral teaching consists in leading a class by distinct steps day by day to sound conclusions from simple data, and to the practical application of these conclusions; but never in giving gratis any conclusion which the boys themselves could draw from the data before them. It does not tell children *what* to think, but leads them *how* to think.

It is by no means necessary that these units of instruction should be identical for all children. To make them so would be to make instruction mechanical, when it should be the living contact of mind with mind. On the contrary, they should always vary, only the principles illustrated will be the same, the nature of the subject matter compelling a sequence sufficiently similar to make the units of like kind though they may differ widely in form, while the particular presentation of each will arise out of the mind of the teacher and the aptitudes and the surroundings of the class. All that is meant is, that in all good teaching the units of instruction will be clearly definable steps by which the teacher knows exactly whither he is leading his pupils.

A provisional series of these steps adapted to the capacity of children during the period from eight to twelve years of age is indicated in Chapter VII. Many of these have been actually given, being modified as the needs of the class seem to indicate. Any of the sequences there given may be taken to illustrate the principle stated above. For instance, in Physics, the basal percepts of the five senses are applied to distinguish between typical solids, to discover some of the simple properties of water and the facts of

gravitation: these, again, are used to discover why some bodies sink and others float, how density is measured, to make clear the nature of water- and air-pressure, and to apply these discoveries to common things. Most of these units represent experiences which must find their place in any effective fabric of physical knowledge, though some may be replaced by better ones, while the exact stages by which each is brought home to a class will never be twice alike.*

In proportion as these truths are kept in mind will teaching be effective and proceed without overstrain, because proceeding according to the actual growth of the mind. The habit of work is developed, but no exhausting work is demanded, because the ideas given are such as germinate and grow. They are remembered because they are understood, and practical results even with exceptionally delicate children prove that this method is the truest economy of power.

In the succeeding chapters an endeavour will be made to show how these principles can be put into practice in the two great departments of Science and History teaching, as typical examples of the method as applied to Realist and Humanist instruction.

* There is, however, one great danger attending the use of these teaching steps. They make things so clear that a child is apt to think he knows all there is to know in the matter in question. This must be sedulously guarded against by showing from time to time that the bulk of applications of every principle are far beyond his powers.

Chapter IV.

SCIENCE TEACHING: WHAT AND HOW?

"For leaving out only some very small classes, what are all men employed on? They are employed in the production, preparation, and distribution of commodities. And in what does efficiency in the production, preparation, and distribution of commodities depend? It depends on an adequate acquaintance with their physical, chemical, and vital properties, as the case may be. This order of knowledge, which is in great part ignored in our school courses, is the order of knowledge underlying the right performance of those processes by which civilized life is made possible."—*Herbert Spencer.*

"Science is simply a higher development of common knowledge, and if science is repudiated, all knowledge must be repudiated with it. Men of science throughout the world subject each other's results to the most searching examination, and error is mercilessly exposed and rejected as soon as discovered. And still more conclusive testimony is to be found in the daily verification of scientific predictions, and in the never-ceasing triumphs of those arts which science guides."—*Herbert Spencer.*

1. Why should Science be Taught in Schools? In the popular magazines the public is frequently informed that "Science declares" this or that notion about the structure of the universe and the inner nature of things, and it is remarkable that the ideas thus dogmatically summed up are often highly debatable. Many of us have little means of judging the value of what is put forward under this awe-inspiring but shadowy authority; we would not appear ignorant, and therefore set it aside to the more convenient season which never comes. We are perhaps shortly consoled by seeing the same words used in support of a totally different theory, and probably come to the conclusion that "science" is but a fine name for the crude notions of the writer, if not for mere intellectual arrogance, and the scientist (obnoxious word) one who would endeavour

"To judge at distance of a thousand miles
With the short-sighted vision of a span."

In fact the public hears too much of science now-a-days, and would rather stand in the old ways and leave science to specialists.

This perhaps does not much misrepresent its general attitude in face of the questions:—Shall science form part of a boy's general liberal education? And if so, what shall be taught, and how?

The answer of the classical man has the merit of being entirely distinct. Professor Mahaffy, Vice-President of Dublin University, has placed this view before the public not long since with the authority of an educational expert. He says: "In this matter I can speak as a specialist, having now for over thirty years examined crowds of boys for matriculation who came from all the higher schools of Ireland, and many also from the public schools of England. It is my deliberate and carefully-formed opinion that, although a great modern system of Intermediate Examinations has been established in Ireland, and thousands of pounds are yearly spent in prizes, exhibitions, and result-fees, &c., the average preparation of boys in Ireland is much inferior to what it was when our schoolmasters were free to teach according to their lights, and this modern system of pressure and competition did not exist. In this opinion the great majority of my colleagues agree, and I hear from Oxford and Cambridge friends, and I can judge from the English schoolboys who come to Dublin, that these also, if they have not lost, have gained nothing by the more recent school system in England."

Professor Mahaffy "can tell perfectly well why this is so. *The whole of a proper University course in its earlier stages is based upon a competent knowledge of Latin, Greek, and of pure Mathematics.* So long as this was accepted, and nothing else taught, boys came up in such a state of preparation that the rest of an University education could readily be acquired. But now that they spend an occasional hour in the week at French, at German, at Drawing,

at Physical Geography, at Chemistry, at Geology, at English Literature, they fail to acquire the fundamental things, and they can hardly acquire any decent knowledge of the rest. And this multiplication of subjects has not only seriously impaired the education of our best boys; it has also made education far more costly; for it requires a staff of masters for all these outlying and educationally worthless subjects, who are maintained by raising the school fees, so that we all pay more and get less real value for it."*

A larger party than the out-and-out classicists are those who admit that some instruction in science is necessary to enable boys or girls to be in touch with the modern world in which scientific knowledge plays so large a part, and to understand what is going on in that world around them; who recognise that unless this instruction is given at school, that it will probably never be given at all; but who would limit such instruction to the later school years, and this seemingly for two reasons: the first, that summed up by Mr. A. T. Pollard, M.A., in the terse sentence that "the minute a boy enters a science side nothing will persuade him to pay attention to literary subjects;"† and the second, that the multiplication of subjects has gone so much too far, that to inflict "science" upon young children is cram of the most pernicious kind.

Now, if "science" in schools means 'ologies crammed in watertight compartments, conclusions and formulæ got up for examinations, a very little of it may easily be too much. That much science teaching is of this sort may possibly go far to explain both the lines of thought indicated above. Some time since a leisured friend of mine, regretting not having learned chemistry in youth, and conscious of a great deficiency, went to a distinguished London Professor to learn its principles. The Professor marked a text-book,

* *Nineteenth Century*, Nov. 1898. *Italics* are ours.

† *Teaching and Organisation.* P. A. Burnett, M.A. Longmans, 1897, p. 20.

and set my friend to go through certain portions of it in the laboratory. It happened that the Professor was at the same time lecturing on the subject to a class, and to enter this class seemed more desirable than to work with balances and chemicals. On permission being asked, the Professor expressed surprise, and explained that these young people were "getting up" chemistry for an examination, and that passed, would shortly have forgotten all about it: because they were learning reactions and formulæ, and had not time to acquire a real understanding of chemical principles and manipulation.

In the quotations which have been prefixed to this chapter, Herbert Spencer brings out the vital fact that "science" is nothing else than exact knowledge of the natural forces around us learned by exact methods. It is not distinctively the study of any particular one of these,—the knowledge of mechanical forces, nor of molecular affinities, nor of the laws of life, but the mental habit of exactitude working towards ascertainable truth by data open to and verifiable by all.

Literary culture stands in quite a different category. Dealing with those standards of taste which are not capable of exact definition, and working towards ideals which are not less beautiful than various—the infinite diversity in unity of great artists and writers—it has no definable basis in knowledge, and cannot be referred to any "first principle." It is "familiarity with the best thought of the world." But exact knowledge in one form or another is the raw material which it handles; and this is the meaning of the statement that all Art, whether plastic or literary, must have its basis in facts. It builds on discovered truths as its foundation, and uses them as its raw material. Hence, in so far as literary culture involves knowledge, it has adopted scientific method. Both criticism and history now look, without preconceived theories, to the exact comparison of facts; and how very far reaching this movement has

been may be illustrated by the single instance, that when the Revisers found a crucial text* to be existent only in later MSS., and not at all in the earlier ones, a sentence whose erasure would once have rent the Church in sunder was dropped from the Canon almost without opposition, and, so far as the public is concerned, without notice.

Scientific method, looking to the facts and the facts alone, and setting verifiable facts as the only data for reasoning, is the legacy of the XIXth to the XXth century, and has become co-extensive with all fields of knowledge. This is pre-eminently true not only of that direction of the forces of nature in the service of man which is the definition of the engineering profession in the Royal Charter of its great English Institution, not only have the products of such direction of natural forces come to be the commonest needs of civilized life, the means of our pleasure and of our social intercourse, but we have now a philosophy "not disparate to that world of sequence and sensation which is the ultimate base of all our knowledge."† This philosophy is for the first time in history based on verifiable data, and therefore may look forward to steady growth, and face the inevitable changes before it, in confidence that these will be of the nature of development and not of reversal. It begins where science ends, in the bearing of scientific truths on the moral problem, but its roots lie deep in the Nature which Science alone reveals, and no great progress in philosophy is henceforward possible to those who have not passed through her gates.

In short, the uses of science are so manifold; future successes in the fields of war, of production, of commerce, and even of philosophy, are so clearly fated to exact knowledge in the hand of resolute will—and the pressure of modern life makes it so impossible for those who are not scientific specialists to acquire it later — that all denunciations

* 1 Ep. S. John, v. 7.

† Frederic Harrison.

against science in schools are but outcries against the surely rising tide. Indeed, the objections made could scarcely have been put forward against science defined as exact knowledge of the natural laws, by obedience to which we live and prosper, and in opposition to which we sicken and fail; and these objections are only valid against modes of teaching which are neither disciplinary nor cultural. Physics or Chemistry got up out of text-books, or remembered from lectures, is so far from being exact knowledge, that it is scarcely knowledge at all. It is outside the definition, and may be conceded to be "educationally worthless." But the exact observation of natural facts and logical inference from them, leading to a perception of Law and a glimpse of the Principles behind Laws,* is its own argument. It is both disciplinary and cultural, and is essential to the education of all who cannot afford to give their youth to mere mental gymnastic, but desire to be fitted for a place in that modern life whose prizes are to directive ability.

2. The Uses of Physical Knowledge. If the first purpose of education is preparation for life, the claims of scientific knowledge can scarcely be questioned. It does not suffice to point to the effective work of specialists in the modern world as a proof of the needlessness for more general scientific knowledge, for the value of science in a general education depends upon the indisputable truth that none can practically use a specialist's work but those who, by bringing it to the test of the general laws on which it depends, can understand its merits and defects in each

* Fact:—Some thing cognisable by appropriate senses, including the relation between facts, *e.g.*, ratios of musical vibrations.

Force:—The means by which facts arise.

Law:—The observed sequence of certain facts on certain forces.

Principle:—The cause of harmony and mutual adjustment between forces of like kind (for the present all but unknown).

Truths:—Statements of facts according to the laws of mind.

partieular case. Indeed, those who do not know these general laws well enough to take an interest in science for its own sake, seldom hear of the work of the speeialist at all. A training in scientifie methods is indispensable for those who are to use scientific discoveries; without this their real bearing eannot be understood; and it is remarkable how the work of the ironmaster and the chemist, of the manufaeturer and the engineer, of the farmer and the biologist, and of applied and theoretical science generally, are coming to overlap.

One example must suffice.

Large sums of money have been spent in Canada by individual farmers in procuring and testing different varieties of eereals and fruit-trees, representing, for the most part, lost time, hope, energy and money. Large sums are still lost in every field and orehard (we are writing of Canada, of course, not of Britain) where an inferior plant takes up the same land, nutriment, and eare, as would another giving double the crop. The Dominion Government, aware that all agricultural progress must depend on the knowledge and direction of natural forces, and that whatever may be the ease with the English farmer, the Canadian eannot afford these losses, having neither the means, the leisure, the knowledge, nor the applianees for biological work, has established experimental farms, one for each typical district of the country; for wet and warm South Columbia, for dry and eold Manitoba, for the Nova Scotian sea-board, and so on. In these farms not only have all promising varieties been eolleeted with a care for the purity of the stock impossible to the general farmer, not only have manures and soils been adjusted to one another like a laboratory experiment, but far more important applieations of seience are being made. "The importanee of breeding new varieties for the special requirements of each region, which has for such a length of time been negleeted in Europe, is fully understood in Canada. Many poor crops

in Europe are simply due to the fact that the same variety of wheat or oats has been cultivated for generations."*

In these farms new varieties are created by the same biologic laws as have doubled the weight of our prize breeds of cattle during the past fifty years. Heads of corn of good, but not entirely satisfactory, varieties, are fertilized with extreme care with the pollen of others which show a different kind of excellence. These heads are tied up in bags of transparent paper to prevent accidental impregnation from other sources, and the ripened seed is gathered with care, planted, and watched, and reaped. From the crops so raised, some of which show an increase of 30 per cent. in weight on the parent stocks, hundreds of samples are sent out to farmers in appropriate districts, with leaflets of information how the seed was obtained and the treatment it should receive. The same care is extended to the chemical adjustment of manures to soils; and to the researches which have proved that the effective enrichment of a soil depends as much upon the bacteria, which are intermediaries between the mineral and the plant, and convey nourishment to the latter, as upon its chemical constituents. All these researches are made accessible to those who need them in their work of directing natural forces into channels which make the prosperity of the individual and of the nation.† Thus not one condition, but all conditions which make for better varieties are studied, the chemical constituents of manure, the bacteriological conditions of the soil, the biological conditions of the plants; and the reward is a steady rise of productiveness.

The British Government, whether from complacent official ignorance of the bearings of science on the agricultural depression, or from a far-sighted confidence in the healthy stimulus of the struggle for existence to the landed

* Prince Krapotkin in the *Nineteenth Century*, 1897.

† This, be it noted, is done gratis, in the conviction that the indirect benefit amply repays the outlay.

interest, does little if anything to encourage such work. There is therefore the more need for such knowledge as the Canadian Government has begun to disseminate; the more need for the scientific instruction of individuals.

While these lines are being written, there has come before the public the account of similar work done at Newton-le-Willows* to solve the problem of producing new and heavier varieties of cereals and grasses. Messrs. John and Robert Garton have there collected over 300 varieties of wheat, 70 varieties of barley, and 100 varieties of oats from all the countries of the world. By cross-breeding these an eye-witness says:—"They have succeeded in producing varieties of wheat the average weight of whose grains is 60 per cent. heavier than the average weight of grains of wheat in ordinary cultivation. I saw a field of black oats, and the grains were as much finer than the best Poland white oats as these latter are larger and finer than ordinary Tartarians." Expert testimony is abundant to the excellence of the new varieties and the soundness of the work that has been done. "Comparatively useless varieties of cereals have been converted into most valuable food plants." "These experiments have been extended over a period of 18 years, and have been conducted on a rigidly scientific basis." "They have succeeded in producing such varieties in cereals as have valuable properties not present in the parent plants."

"Not only are the results already obtained of immense value from a food point of view, but the system perfected by Messrs. Garton is capable of almost unlimited extension and development."†

* *Daily Chronicle*, August 12, 1898.

† In the face of facts like these, is it wise to take an instance of good rule-of-thumb husbandry out of the Georgics of Virgil, and lay stress on its *rationale* having "only just been explained by modern science," as if this were a type case showing the study of biology superfluous? If these lines should fall under the eye of a well-known Oxford Extension Lecturer who was good enough to take the chair at a lecture I once gave, and of

All this and much more is the result of applied science. Why is it not more widely known? Because the want of scientific training makes it impossible for the public to form an intelligent judgment on experimental work. Scientific papers and books, records of results as yet imperfect, are simply not understood by most of those for whom they are written, because these are not trained in the methods on which scientific work proceeds, and cannot distinguish between genuine work and puffery. Science training is needed, not to make farmers and landowners into biologists —that is neither possible nor desirable—but to enable them to appraise and apply the work of biologists.

Not in agriculture alone is it true that modern *materiel* is the result of chemical, mechanical, or other applied sciences, and can be successfully handled only by those who understand these. It is true of the three hundred millions sterling of the annual manufactures on which Britain's prosperity so largely depends. It is true for naval and military men; there is no need for them to be chemists, electricians, or engineers, but there is every need that they should know enough of chemical, electric, and mechanical forces to know exactly the principles of the instruments they have to use. It is true of Medicine, the only profession in which its truth is adequately recognised; whose professors lament the inefficient and inexact general education of so many of their students.* It is true even of Law, where I am informed that counsel who can conduct a patent case are lamentably few. It is true of Religion, for the loss of influence of the clergy is mainly due to the inability to handle biologic, geologic, and critical truths, and to discriminate between

whose genial courtesy I have a pleasant memory, I would entreat him to consider that what was to him merely an illustration of the value of experience was, I found, taken certainly by some, probably by most, of his hearers, to mean that agricultural (and educative) "science" is merely the finding of fine names for processes already perfectly well known, and on the whole needing no improvement.

* *Lancet*, Feb. 1894.

scientific facts—which sooner or later fall upon the opposing theologian and leave him a corpse by the wayside—and hasty theories, begotten for the limbo prepared for all things born out of due time.

In short, a general training in science is required in all these walks of life even to enable a young man of the class we are here considering to specialize with effect, and the opinion that "the great need of modern education is that it be imbued throughout with the scientific temper,"* has vastly more varied experience to support it than the dicta of intellectual Brahmins, who avowedly regard their classical vedas as the only knowledge for the undergraduate, and would still continue at the University the general education in Latin, Greek, and pure Mathematics. This, carried too far, positively unfits for ordinary life the average young man, destitute alike of political "interest" and of the scholarly brilliance which might replace those family connections that so often determine both the after career and the choice of the public school that gets the credit for it.

3. The Early Stages of Scientific Knowledge. Admitting, then, the claims of physical and natural sciences to a place in a school curriculum for boys of the professional classes, and that the end of scientific instruction is the development of the scientific temper of thoroughness and exactitude in dealing with natural facts and laws, the question before us becomes—In what order should these follow one another, and how should they be presented so as to conform to the educational principles already laid down?

If science has been truly said to be in minds rather than in books, and to be a temper of exactitude rather than a store of knowledge, then the history of its growth in the minds of men must inherently depend upon the working of the human mind along this particular line of development,

* The *Times*, Dec. 12, 1896.

and an examination of this history should answer both these questions.

Physical Science begins in man's appreciation of numbers, forms, and movements, and his desire to define their limitations in Time and Space;* Natural Science begins in his endeavours to perceive some system or reason in the natural facts about him. These have given rise to three parallel lines of study—Geometry, Dynamics, and Natural History (Biology). Geometry, the science of Form, is probably the elder of the group, for not only does Euclid's standard treatise date from 480 B.C., but some knowledge of Geometry must have preceded the great science of the ancients—Astronomy. In the nature of things no observations on the stars could be made in the absence of geometrical concepts, such as angular elevation or depression above or below the horizon, and of angular distance from the North.

Callisthenes obtained in Babylon a series of Chaldean astronomical observations ranging back through 1,903 years. The Babylonians had fixed the length of a tropical year within 25 seconds of the truth; their estimate of the sidereal year was barely two minutes in excess. They had detected the precession of the equinoxes; they knew the cause of the eclipses, and by the aid of their cycle, called Saros, could predict them. Their estimate of the value of that cycle, which is more than 6,585 days, was within 19½ minutes of the truth.†

Indeed, Astronomy as a science dates back to the earliest Chinese, Indian, and Assyrian records, which contain correct astronomical data of eclipses and declinations more than 2,000 years B.C.; and that their systems came down

* Strictly speaking, of form and force alone, for Number itself is known by forms, and Time is known by change, which is alteration of form in some way or other. But both Number and Time are so interwoven with our current perceptions as to constitute fixed experiences. Space, similarly, is a negative concept derived from form and its extensions.

† Prof. Draper.

from a still remoter antiquity is proved by the fact that the divisions of the Zodiac are distinguished in all by the same, or very slightly differing, signs.

This early science, however astrological in its application, was really a study of motion by means of one special set of examples; it was a vast and laborious collection of horizontal and vertical motions, and must have involved centuries of observations and record by priesthoods who were in very truth guardians of knowledge, which they may indeed have made esoteric, but was necessarily hidden from the vulgar by the simple fact that a harmonizing law wherewith to interpret the mass of observations had not been found; the only means of acquiring that knowledge was to become a hierophant, and to devote a life to its detail.

The first consistent physical theory of Astronomy, by which it could cease to be a priestly secret, would seem to have originated among the Greeks, and to have proceeded from purely geometrical considerations. The angle of elevation of a setting star being observed both at Alexandria and Rhodes, this star was found to be still a degree above the horizon to the southerly observer at its time of setting to the northern station. Hipparchus and his school deduced from this the sphericity and size of the earth, and as there were no data for a contrary opinion, naturally imagined this sphere to be the centre of the universe, a supposition which the human mind, accustomed to subordinate even its deities to terrestrial affairs, found eminently reasonable.

As soon as the attempt was made to harmonize the observed motion of the heavenly bodies on this supposition, it was found, that whereas the multitude of stars appear to move daily from east to west, and also to have an annual cycle of motion higher or lower in the sky, that six bright "wanderers" were exceptions to this rule. Consequently each of these "planets" was surmised to move in a crystal sphere or "heaven" of its own, and the Ptolemaic astronomy,

basing its theories on the perfectly correct observation of the apparent paths, invented a most ingenious system of epicyclic or rolling motion, which was not only mathematically accurate and truly descriptive of the planetary courses, but also lent itself to the current theogony. It was truly scientific, for it was admittedly (at least at its inception) a hypothesis, but it was supposed to be final and absolute truth; divine abodes were localised in these crystal spheres not only by heathen, but even by Christian writers, and then it cost a revolution and *autos-da-fé* to dissolve them into ether and gravitation. During the eclipse of knowledge which followed the fall of Rome, this astronomy lost its central truth—the sphericity of the earth—which the Dark Ages asserted to be flat, in order to harmonize with a fanciful interpretation of Holy Scripture, till actual circumnavigation of the globe restored the forgotten truth, which then, after two centuries of contest, vindicated its claim to orthodoxy.

At this time all motions were treated as proper to the nature of the moving bodies, which were supposed to "tend" towards their allotted places in the universe. The idea of Force as the one cause of motion was not yet developed; not only was the motion of a star thought to be inherently different to the motion of a stone from a sling, but the motion of the object in a ship was held to be different in kind from that of the vessel. All natural motion, in fact, was held to be diverse and inherent in the nature of the moving object: stones tended downwards by affinity to the earth, flame upwards by affinity to the heavens, and every object to its own fitting place in the universe. Facts had been collected in abundance, but theory was still arbitrary and theological, and at the close of this first period of scientific progress the harmonizing law was yet to seek.

4. The Second Stage of Scientific Knowledge. The

new departure began with Leonardo da Vinci, artist, engineer, and man of science. Experimenting on the actual facts of motion, he discovered its first and second laws—that all bodies continue at rest or in straight uniform motion till acted on by force; and that changes of motion, in whatever direction, are proportional to the force acting in that direction.

The New Mechanics of the XIVth century is associated with the names of Copernicus, Galileo, and Kepler; and its momentous departure consisted essentially in the recognition of Force as the only cause of motion. Forces giving rise to geometric paths, the planetary motions became at once merely one set of instances of a general law. Great simplification of detail resulted—all the old complexity of cycles and epicycles, of "primum mobile" and inherent motions, of the alien natures of "celestial" and terrestrial bodies, melted away. The union of the parent sciences of Form and Force gave birth to the hypothesis that the Earth might possibly not be the central member of the solar system, but might be in orbital motion round the Sun, and this was found to cover all the observed facts. Gravitation as an experimental fact was of course familiar from the earliest times, and the dictum that most bodies tended towards the Earth was even a truism, but Leonardo knew this "tendency" as a force, and measured the acceleration produced by it on a falling body as 16 feet per second. It remained for Newton to complete the grand generalization which showed this force to be the prime mover in planetary reactions, and therefore the cause of planetary motions. Knowing by observation that the Moon revolves round the Earth—that is, is continually deflected from a straight path—and that the acceleration of a falling body is 16 feet per second, he set himself to harmonize the two. Could the circular motion of the satellite be the joint result of its tendency to go straight forward in the line of its momentary orbit, and to fall towards the Earth? Calculation showed

the fall of the Moon towards the Earth to be just that amount, and gravitation as the proximate cause of planetary motion was established.* The inference was verified in a hundred ways, and gravitation was shown to extend to the remotest limit of the material universe, to be the efficient explanation of motions across inconceivable abysses of space, and to furnish unerring data for calculations of eclipses and other verifiable stellar phenomena for indefinite periods of time, backwards and forwards.

With this revelation of Force came the study of other forces of Nature as forces. Instead of masses of phenomena, recipes, and detailed alchemical instructions how to prepare liver of sulphur, calces of mercury, aerial spirit, and the like, gravitation, heat, light, electricity, magnetism, and chemical forces were severally studied, and their effects measured, with the view of discovering the sequences pertaining to each. Phenomena were no longer dealt with from the point of view of inherent properties, but were grouped according to the forces manifested. The truths thus discovered gave an enormous impulse to further research, because laws, which could be rejected only by those ignorant of the facts, made the collaboration of many minds now for the first time possible. Römer, accepting the astronomical data, discovered the velocity of light coming from the satellites of Jupiter, and hence of all light; Laplace, accepting the laws of heat and motion, developed the nebular theory, which gave a complete explanation of the elliptical orbits, the nearly uniform inclination, and the flattened forms of the planets, of the central heat of the Earth, of the incandescence of the Sun, and of many other facts. A hundred

* The balderdash current even among "educated" persons with reference to Newton about apples and gravitation, illustrates the crass ignorance of the English public on all that science really means; and this almost inconceivably dense stupidity regarding natural laws and the process of their discovery, is perpetuated by a school system which makes most of its recipients mere rag-bags of disconnected formulæ.

other examples might be given of the advances made by this correlation of the various branches of research.

Between Leonardo (1451-1519) and Laplace (1749-1827) the study of force may be said to have displaced the study of matter as such: the categories of chemistry, heat, light, electricity and magnetism were formed, and by the end of this period each of these had become a "science," though in the early stages the line between each was barely defined. With Leonardo had begun the system of measurement, as opposed to *à priori* theorizing with mystical or theological premises, on mere qualitative results, which had given rise to so many barren disputes. Galileo, Torricelli, Newton, Laplace, and others, extended that measurement to all mechanism, terrestrial or celestial. The industry of the physicists of the Eighteenth century then collected a mass of data upon the sequences of force-effects which far exceeded even those of the astronomers and alchemists. Another great generalization was needed to do for force-phenomena what had been done for matter-phenomena; to find a common basis which should harmonize the isolated groups, and reduce the detail by bringing these under one law. All the former phenomena had been found referable to molecular or molar forces; all these in their turn were to be found referable to one archetype of Power, or Energy.

This discovery belongs to the XIXth century. Count Rumford,* investigating the nature of heat, discovered that the amount of heat produced in boring a bronze gun is precisely proportional to the amount of power expended. Other experimentalists, notably Joule, followed and made the same discovery with regard to electricity, magnetism, and light. The amounts of each of these corresponding to a fixed amount of power, were measured, and the great truth of the conservation of Energy was formulated: that motion, heat, light, electricity, magnetism and chemical affinity, are each a form of energy, and that—in contrast to the chemical

* Benjamin Thomson, 1753-1814.

elements, such as metals, carbon, oxygen, &c., none of which have as yet* been changed into another—all these forces are very readily interconvertible; definite and measurable amounts of motion being transformable into quite definite and measurable amounts of heat, light, electricity, &c., at will.

These results were reached by a system of most careful measurement and comparison. Instruments of precision made accuracy possible, and as a natural result, residual phenomena—small divergences from calculated weights, slight departures from sequences which all but the most careful observation considered absolutely correct, results slightly anomalous to laws admittedly valid,—rose into importance, and became, as they are still, the clues to fresh discoveries. The careful examination of the infinitely little compelled specialisms indeed, but specialisms which arise out of a few general laws, and are intelligible to those, but only to those, who hold their master-keys.

5. Correspondence of Individual and Race Acquirements, First Stage. It would far exceed the scope of this little book to trace the growth of science in the XIXth. century. Nor is it necessary. Enough has been said to show the natural order and the process of this growth.

The *order* is :—

(1.) The formation of categories of material things, the miscellany of experimental facts :

(2.) The unification of phenomena by means of the concept of Force, the consequent formation of categories of Forces, and the discovery of the sequences which follow on the application of these; in short, the realization 'How'—in what manner—due to what kinds of Force—phenomena occur :

* If the chemical "elements" should eventually be found to be modifications of one or more primal types, and to be transmutable under suitable forces, this would not affect the past order of discovery.

(3.) The unification of Forces by the concept of Energy, and its accurate measurement, 'How much'* of effect is assignable to each of the powers in action to bring about a given experimental result: and,

(4.) Lastly, the stage of specialism, or of philosophy working towards some still higher generalization which will probably unite under one law the vital and psychic sequences which yet seem disparate to the world of physical sequences and causes.

In each of these stages the *process* is:—

(1.) Observation, including measurement, comparison of results. Formation of a hypothesis, simple or complex.	Inductive or empirical stage of a science.
(2.) Definition of the subject matter, and colligation of definitions into a logical theory on the given premises. Application of this hypothesis to kindred facts. Verification by the number of facts explained. Discovery of residual unexplained facts, with which the process begins anew in whole or in part.	Deductive or formal stage of a science.

Till a science has passed through both these stages it is not full-grown. The first stage collects facts and infers their explanations; the latter posits definitions which experience has shown to be true, deduces known phenomena from them, and predicts others. Geometry will occur to every one as a complete science which has passed through the second and formal stage; Psychology as an incomplete science, not yet emerged from the collection of data and empirical explanation.

* "Why" is not dealt with, for "why" sequences occur is essentially a moral question, transcending proximate physical causes altogether, and really depends on the Principle standing behind Forces.

This process is common to all reasoning creatures. Depending on the nature of psychic action, it can never, whether its material be qualitative or quantitative, physical or humanist, be other than that founded on that mental order of working which Chap. III. endeavours to set forth. The educational inference is patent: All genuine knowledge must pass through both stages—the process is one of induction and deduction combined, not of formal and quasi-final science alone. But the educational bearing of the *order* of growth is less immediately apparent. It is of course not to be thought of that the actual history of scientific advance is to be repeated for each learner, that he should follow the devious roads by which truths were reached, and explore the limbo of forgotten theories. But a broad educational sequence stands out clearly, a sequence which corresponds strikingly to the aptitudes of different ages, which were brought out in Chap. III.:—

(*a.*) The kindergarten age—up to 7 years—learns the discrimination of sense-impressions, and finds delight in this without thought of ulterior purpose.

(*b.*) The years from 7 to 12, when the mind is too interested in the qualitative relation of things to grasp quantitative ones also, and observes phenomena only, more or less consciously forming them into categories.

(*c.*) The age from 12 to 15, when the interest in mere phenomena begins to pall, and the desire to know proximate causes awakens: when some familiarity with the "How" enables the mind to turn to the "How much."

(*d.*) The period of adolescence, which desires some guiding clue through the maze of knowledge, some unifying principle assigning to each its place, and finds this in the laws of Energy.

This should end school instruction. For those who go on to the specialisms of science, or to philosophy, the University is the place where these should be acquired, and

acquired under free choice by specialization in any of the many ways which are cultural as well as disciplinary.

But the early stages will be as different from the text-book science as the Kindergarten instruction is different from the laborious teaching of formal arithmetic and grammar, which it has made obsolete for that age. The age (8 to 12) is unsuited to any knowledge taught deductively (*cf.* Chap. III., par. 3), and the first beginnings of scientific knowledge would not be recognised by many as being such.

The cutting out from ruled paper of squares and rectangles of given length of side, and of triangles from them, the examining and comparing these, the fitting them into circles, the drawing of the figures cut out and making regular patterns of them, may be scorned by the adult, but is welcomed by the child, to whom it is true geometry, the measuring of regular forms. Familiarity with them comes of handling them, and they have become permanent concepts to him by the time that he has consciously to reason about them.

The physics we teach at this age is not a formal study of forces, pressures, inertia and specific gravity, but the discovery of certain typical examples of these chosen in an order which will lead to more advanced knowledge, without any strange nomenclature to take off the child's mind from the thing in the effort to remember the word. Every lesson is "heuristic," discovering for themselves. The class of little children must examine things and describe them aloud by their properties, must name their shape and size, must say are they solid, liquid, or gas; of what colour, are they transparent or opaque, bright or dull, moving or still, crystalline, powdery, grained, or fibrous; hard or soft, stiff or pliable, strong or weak, springy or plastic, heavy or light, warm or cold, sweet, sour, bitter, &c. They sort earths, rocks, and ores by these properties, applying all that they have learned; they experiment with water,

filtering, weighing, boiling, condensing; they find experimentally the point round which various flat forms will balance; they vie with one another in gauging, weighing, and measuring, and the three hours a week given to physics is looked forward to with delight, while yet a severe training in observation, accuracy, and skill. A child of nine can easily weigh to 20 milligrams, and measure to a millimetre. More is not required; greater accuracy comes in time, and then more accurate instruments will be treated with the care they merit.

In botany, observation in the garden of the forms of roots, stems, leaves, and flowers precedes all attempt to classify:—not the botany of the text-books, but the plants themselves will take up the first two years; after which the children will themselves call for the study of function, and all without the Latin and Greek names, these aids to the student already familiar with the plants—who can realize that the name is a compendious analysis—but pests to young children, who want to see things, not to class them.*

An examination of our syllabus (Chapter VII.) will show more fully the sequence in all these "nature subjects," and will illustrate the two principles for which we contend:—

(1.) That in this specially inductive stage of the mind, it craves for material whereon to exercise itself, not for abstract knowledge: and,

(2.) That unless this stage is passed through in its entirety, subsequent abstract knowledge is largely technical memorizing, which misses the true end of science teaching—the habits of observation and accuracy—

* One of the common futilities of science teaching is to give children primers to study in place of actual experiment, words instead of experiences. Sometimes this is rendered even more incongruous and unsuitable by the primer being in some complex science-like physiology, which belongs to that advanced stage of knowledge when the learner can base it on mechanical and chemical concepts, by which alone it can be intelligently understood.

overloads the curriculum, and leads to mental overstrain.*

6. Second Stage. The Study of Forces. Neither the next stage, from 12 to 15, nor the succeeding one, is strictly within the compass of this book, which deals especially with the instruction from 8 to 12, but a few words are not out of place to show the continuity of teaching.

After the different effects with which the preceding years have familiarized the child, the idea of Force as the cause of them all will come to him as naturally as it did to the successors of Leonardo. Such skill as he has acquired in weighing and measuring will now be used and improved upon. Dealing with certain typical forces of Nature separately considered, the teaching at this age will gradually merge into the more usual forms of science, known as chemistry, heat, and electricity, which deal with their subject-matters quantitatively. The natural historical order of discovery again offers pregnant suggestions for the succession of "subjects" and for the mode of their treatment. Chemistry, "The Grammar of the physical sciences," soon diverges from, but begins with, general physics. The laws of heat are essential to the comprehension of other phenomena, and this branch of physics should come first. It will also familiarize the mind with the idea of a force which evades all the senses save one, and render it better able later to grasp the idea of electrical "flow," analogous to heat, but eluding even the sense to which heat appeals.

* *E.g.*—The Science Master at Charterhouse School writes in "*Nature*," July 7, 1896, that "Experience shows us that boys who have gone through the entrance scholarship have, in most cases, had all aptitude for science knocked out of them." The reason for this is perfectly obvious. In the case of boys who, called upon to "get up" physics for an examination, have to form their notions of strange things and forces, to analyze them quantitatively, and to apply their knowledge all at one and the same time, the overburdened mind is unable to take interest, and its one thought is to cram up just what may be required for a pass, and to disregard all else, however vital to an understanding of the subject.

Chemistry will begin with studies in measurement and manipulation, weighing and gauging. It is a science which so markedly followed the general stages developed in para. 4, that there seems every reason to follow those stages in school instruction, and treat it historically by doing the crucial experiments, or modifications of them.

Where a certain amount of practice in weighing and measuring solids, liquids, and gases enables the learner to handle these, the law of volumes and pressures should be experimentally discovered as Boyle actually discovered it; using, moreover, the crude forms of apparatus which were perforce used by early experimenters, and are more adapted for youthful hands than expensive and delicate modern instruments.

Priestly's crucial experiment involving the discovery of oxygen may be given in substantially his own form, though with a better induction.

Cavendish's experiment on the absorption of this gas by moist filings, on the product of combustion and respiration, lead naturally to those of Black on the expulsion of carbonic acid from chalk, and to the generalizations of:

Lavoisier, whose classical experiments on the increase of weight involved in the calcination of lead and mercury may be given here, leading to the crude composition of air.

It is essential, however, to adequate grasp of chemical principles, that the student should himself, with his own hands, do the leading and typical experiments; merely *seeing* them done leads to carelessness, inattention, and helplessness.

From this point Chemistry and Physics definitely part company; the discovery of typical elements and their reactions dealing with a kind of force seemingly totally distinct from those of which Physics takes account. Typical reactions should be gone through qualitatively and quantitatively, as given in the modern primers, and by the end of the 15th year the student should be ready for Dalton's Laws

and general inorganic chemistry and simple analysis. The 330 lessons available for our course may be distributed somewhat as follows; the exact time and order will of course vary with every teacher.

1st stage. Weighing, measuring, gauging and simple chemical manipulations. Observation of chemical likenesses and differences, as in early physics. Discovery that matter does not vanish, but only changes its form. 30 lessons.

2nd stage. Discovery of typical elements (metals and non-metals) from their compounds. Re-combinations. 90 lessons.

3rd stage. Proof that they combine in certain proportions by weight, and, for gases, in certain proportions by volume. Atomic Theory. 60 lessons.

4th stage. General inorganic chemistry, the reactions leading to analysis of simple salts. Potential energy of molecules, and electro-chemical theory. 150 lessons.

Physical instruction will follow the same type. For instance, in Heat the stages are:—

(1.) Change of temperature, and its effect on solids, liquids, and gases. Temperature and its measurement by dilatation.

(2.) The discovery of the distinction between quantity and intensity of heat; calorimetry. Specific heats.

(3.) Latent heat, and its resulting phenomena.

(4.) Dynamical equivalent of heat.

No abstruse matter should be taught, but only fundamental principles, and if this will be observed it will be found that a sound and durable knowledge of the three or four leading laws of the subject can very readily be acquired; laws which will enable complicated heat phenomena to be easily understood in later years.

The study of heat paves the way for that of the power which is so largely and increasingly utilized in modern civilization—Electricity. Here the mass of material to be dealt with is so great, that it seems advisable to depart

from the strict historical order of discovery, and to deal with the easily controlled electricity from the battery or dynamo, rather than with the more unmanageable frictional electricity from the Wimshurst machine. Nor is it possible to be as complete as the treatises, in which are found descriptions of toys of purely antiquarian interest, and obsolete or obsolescent theories, together with the mathematical results of Professor Helmholtz, Lord Kelvin, and Clerk Maxwell, involving the higher calculus. These are often admirable as works of reference, but not as school text-books. If the fundamental laws of electric potential, resistance, and current, in their simplest applications, are well understood, the full purpose of a school course has been gained.

But though the subject of frictional electricity be omitted, the general line of historical development still furnishes a rough outline of the sequences, which may be put in some such order as the following, covering about 360 lessons: The leading facts of magnetism and chief magnetic measurements; the effects of a "current" by the phenomena of (1) heat, (2) motion, (3) magnetization, and (4) electrolysis, which it produces, and its measurement by (2) or (4); the variation of a current by resistance, and measurements of the same; the idea of electric potential, and its measurement by attraction of parallel plates, (Electrometer): the facts of electrical induction and influence of the dielectric; the laws of capacity and electrical charge; the application of the above to the dynamo and electric motor; ending with electro-magnetic system of units, and possibly some amount of electro-magnetic theory.

Such a course would give such a sound working knowledge of physical laws as would give a basis for later specialization if required. It will not make chemists or electricians, but it will enable a student who follows it no further to understand effectively the many applications of electricity with which he must be brought into contact, and will give

him a discipline in exact methods which no other training can confer. But that this may be gained, it is again essential that practical familiarity with the phenomena should precede the general laws which make the estimate of the phenomena easy. If a boy is called upon to learn general laws at 14 or 15 years of age, having up to that time had no definite concepts of the particulars which they explain, and on which they are founded, he is in fact called upon to collect his material, form his notions, and complete his reasoning at one and the same time. This is cram, whether it be taught at school or by an "Army coach," and such teaching (unavoidable when the early years have been lost) is a mere pernicious memorizing, to which any understanding of scientific principles can be only incidental.

7. Cultural Value of Science. We have now endeavoured to show the practical use, a rational method, and the disciplinary value, of science teaching. But there are many persons who admit both, while denying to it any cultural value. Even if their position were admitted, usefulness and discipline would still in a work-a-day world take precedence of culture for those who have their own way to make. To be able to lead a cultured life we must first of all make a living. The denial, however, be it noted, comes chiefly from those who lament the revolt against Authority in Church and State, which is, they say, a distinctive feature of this "scientific age." The devotion to temporal gain, the eclipse of Faith, the growth of materialism, and the "rationalist temper," are by them referred to the dominance of science; and, accustomed to regard all teaching as the sedulous inculcation of opinions, they naturally object to a teaching which they imagine to be the substitution of rationalist opinions for orthodox ones.

This attitude has been abandoned by those broader minded clergy who, having some scientific training themselves, are

well aware that the hypotheses too often set as final results before a public which knows science only by the magazines, are in fact nothing but very tentative and *ad interim* conclusions in a perfectly healthy and quite logically necessary development. Nevertheless it must be admitted that the eclipse of Faith by a tendency to look no further than material causes, does often darken many lives, and the kernel of the matter seems to be that current ideas of Authority are changing.

The ideal of Authority which is natural to the average human mind is always that of a wise and beneficent despotism. Under such a figure the Government of the World is usually presented. Not the Sovereignty of Ethics over the undying soul, to whom this life must ever in the last analysis be as the passing hour—strengthening it to dare greatly, to work for distant results, and to endure steadfastly to the end—is chiefly insisted on, but rather the passiveness of the clay to the potter. The duties of humility, obedience, and resignation are taken as the specially Christian virtues, and the half-truth is transferred to human relationships, and made the typically correct attitude to embodied Authority. To order himself lowly and reverently to all his betters, to speak no evil of dignities, and to regard the powers that be as ordained of God, are dwelt on not as half, but as the whole, of human duty.

The natural tendency of fallible men in authority to set their conclusions for absolute truth, has ever been the worm at the root of Authority itself, and the real question involved is whether the highest truth we can reach is absolute or relative. Truth absolute admits of no progress, and scarcely of re-formulation: simple acceptance is the only reasonable attitude before it. If it were indeed absolute, even persecution would be logical, and might even be, as Loyola and Calvin thought, a duty. But the definition of truth as statement of fact by confessedly imperfect minds, cuts the ground from under the feet of

intolerance by rendering unavoidable the conclusion that all knowledge is subjective, depending on the faculties of the observers; and all truth relative, for all truth is verbal statement. Statements of facts, or the relations between facts, by instruments imperfect at their best, must inevitably mean that the white ray of Heaven is coloured, distorted, and obscured, even by the purest of human media. Not only are all truths relative, and not absolute, but they involve a "personal equation" also, for they are expressed in language which results from personal and national proclivities, and has grown from earlier and less perfect phases. In scientific truths this personal equation is nullified by the constant revision and examination at the hands of other observers of the truths put forward by any one, and the subjectivity that remains is not that of any individual, but of mankind collectively, and, could it be avoided, would involve the loss of that human solidarity which is at once the *raison d'être* of knowledge, the basal fact of Christianity, and the hope of the race.

"*The* truth" of men clothed in a little brief Authority may to them be absolute, but to the scientific temper all truth is relative, and the unalterable decision of Time has gone forth against absolutisms in all phases of human thought. The need for Authority remains, but Authority itself has changed its status. It is the embodiment, in person, record, or law, of the best yet known; and must be obeyed, ay, and enforced, but it rests on verifiable data. If there is one lesson to be learned of Science more than another, it is caution; that long and careful study alone can make opinion of any value at all, and that experience only gives the right to declare what has been verified and what has not.

Science then, whether physical, natural, or social, recognises Authority to the full, but it is the Authority of those who have honestly sought and striven and endured, with pure hearts and clean hands, for the solution of the

problems and the fulfilment of the duties committed to them; and this modified conception of Authority has sprung from the idea which alone can bring an ordered cosmos out of the chaos of modern individualism—the idea of Law.*

"The Humanities" confer taste, grace, style, learning, philosophy, but they cannot reveal Law—that terrible fire of GOD, which consumes eternally the truthless chaff and stubble in men and things, but leaves the imperishable gold; commanding a reverence which none but the fool can refuse, and compelling an allegiance to which all must bow. It may confidently be stated that whenever science 'puffeth up' an otherwise intelligent student, it is an indication that his teacher leaves him without a glimpse of the abysses which open at the limits of our knowledge, or assumes that blind physical forces can explain all phenomena in presence of the great unknown co-ordinating force of Life, or even (Heaven help us all!) puts the mere name of a partly known process for an effective cause. But to know a process is not to understand its cause; no, not even though we name that process Evolution.

So constantly has the attitude of the greatest men towards Nature been that of Newton—who felt "like a child picking up shells by the shore of a boundless sea" in presence of that awful Power which works in the universe by the delicate interaction of stupendous forces, and has ordered the inner principle of things so that their development unerringly

* Nevertheless, it is true that the intuitive action of mind, working deductively from its own moral insight, has been capable of reaching the same end by a shorter road. The Logos of Plato, the indwelling Archetypal cause of things, bringing all into order by internal operation, and externalizing its attributes in forms of matter and forms of life, is essentially the same conception as that of the Spirit of GOD moving over the formless void and bringing out of the chaos the forms of an ordered world, and that of evolutionary law working in cosmic and organic protoplasm. But this deductive proof remains unconvincing to all minds which have not the same perception already: it is not persuasive, because founded on internal data not verifiable by all men.

makes for that Righteousness by which alone men and systems, nations and governments, can grow and endure,—that it is not too much to say that the cultural value of effectively taught science is a Socratic knowledge of our own ignorance, and reverence and humility before the Power whose ways are not as our ways, nor His thoughts as our thoughts. The mind that feels thus may indeed refuse homage to many particular interpretations of contentious men, who belittle the teachings of Christ, while yet standing in joyful obedience and reverent awe before the majesty of Laws which reveal One Mind pervading all Nature, from the bacteria in the soil to the soul of man, and from the cosmic dust to the solar systems; seeing well that

> "Earth's crammed with Heaven,
> And every common bush afire with GOD."*

And withal, though it shrink from the treason of denying truths once clearly seen, it knows, too, that each addition to knowledge does but "widen the sphere of surrounding nescience;"† knows that all truth is expressed in words which at best are but fossil analogies, often but sadly material and inadequate; and knows that all knowledge must from time to time be re-phrased, re-modelled, and renewed; in short, that it is the moral law alone that never faileth, for all the knowledge of men in any age "passeth away."

There is therefore far more to be said than to chronicle the laments of scores upon scores of our youth who, at their entrance to manhood's struggles, lament the time wasted on Latin Grammar.

Scientific knowledge is the condition of our understanding the purpose of our age and the full meaning of Law. The exhaustive proof that Absolute truth is impossible to man is a bequest of the dying century, a bequest which cannot

* E. B. Browning. † Herbert Spencer.

be refused. If it is not to cast us with blank Pessimism, it must be reckoned with and understood. The philosophy which has now grown out of swaddling clothes does not rest on intuitive perceptions of master minds, however true these may be, but is broad-based on physical science, proceeding by exact methods to hypotheses whose value can be estimated only by judgments trained to discriminate between the plausible and the proven. This training is the special cultural value of science, and thus does Science minister to ethical development far more than by improved processes of manufacture.

Growth is the note of life, and mental growth of mental life. Nature is changing, because living and active—the expression of the many attitudes of the One Spirit externalized as passive substance, active force, living power, Youth and Passion, Strength and Hope, Love and Death; and the scientific man may see this living Principle eye to eye with that great poet whose culture came not from Latinity, but from Science :—

> In Lebensfluthen, im Thatensturm
> Wall' ich auf und ab
> Webe hin und her
> Geburt und Grab
> Ein ewiges Meer
> Ein wechselnd Weben,
> Ein glühend Leben
> So schaff' ich am sausenden Webstuhl der Zeit
> Und wirke der Gottheit lebendiges Kleid.

Chapter V

HISTORY TEACHING.

"We are very clumsy writers of history. We tell the chronicle of parentage, birth, birthplace, schooling, schoolmates, earning of money, marriage, publication of books, celebrities, death; and when we have come to an end of this gossip no ray of light appears between it and the goddess born."—Emerson. (*Shakspere, Representative Men.*)

"I take the cream of all history to lie in the contrast between the changing activities of Man, brought face to face with the unchanged features of Nature. And these contrasts arise, not out of the lapse of time alone, but from difference of development."—C. F. Keary, M.A., F.S.A. (*The Vikings of Western Christendom.*)

"Even the dreariest chronicles contain within them—they cover up and conceal, but still hold—the records of a mighty activity, a quenchless life, which the highest arts of the historian could never revivify in half its natural fire and beauty. That incomparable power—whether you call it human or Divine—which moulds human history into shape, greater than any power of any artist, is not only always at work, but can be always seen at work, though dimly seen sometimes through the meagreness of our records."—C. F. Keary, M.A., F.S.A. (*The Vikings of Western Christendom.*)

1. The First Principles of History. The first principles of Geography have been already defined in Chapter II. as direction, distance, and level; of Geometry, as concepts of length, area, solidity; of Physics, as the external differences of objects and effects; of Grammar, as the correlation of the word to the thing, quality, action, or emotion: in short, on the mention of any of these subjects certain definite first principles occur at once to the mind, without the guidance of which its elementary study is almost unthinkable. In the case of History this is unfortunately not so. Nowhere have methods which proceed in entire disregard of fundamental principles produced more

disastrous effects. To say that History is, nevertheless, governed by definite underlying principles, is only to say that it is like every other subject with which the human intelligence is rightly concerned; but the fact that these principles are not immediately apparent as in other cases, perhaps accounts for the extraordinary disregard of them in the text-books and methods of teaching modern history in use in our schools, and also for the neglect, if not the positive dislike, of the subject which is revealed in the casual conversational references of nine out of every ten men and women of average culture.

Before making or allowing such a charge against existing methods, one naturally turns to the latest statement of competent authorities as to what either is being done, or should be aimed at, in schools. Seeking this in a work which claims to be a "Manual of Practice," and which is the output of the combined efforts of a very strong Educational Committee,* it is somewhat surprising to find, in lieu of it, the following assertions :—

1. That the History taught in schools "has the same relation to the science of History that animal physiology has to surgery."
2. That History "in the highest sense of the word," *i.e.*, as "the study of the development and organization of the State in all its varied forms, is no more a subject for school instruction than Therapeutics."
3. That two hours a week has been "conceded" to it in our public schools out of deference to a "vague sentiment that boys should know something of the history of their own country."

Finally :—That as large numbers of boys never go to the Universities at all, and *therefore*† no historical superstructure is ever reared on the foundations laid in

* *Teaching and Organisation.* Edited by P. A. Barnett, M.A. (Longmans, 1897.)

† *Italics* are ours.

> early years, we are not to teach "solely with a view of the pupils profiting by the early instruction when their minds begin to open and enlarge," but "we must so teach history as to develop the intelligence, to quicken the powers of attention, observation, and reasoning, and we must not rest content unless we can point to some definite store added to the treasures of memory."

To the first of these statements it can only be said that *if* the history instruction given in our public schools really did bear the same relation to the science of History that animal physiology does to surgery, *i.e.*, if it supplied facts for the science of History to apply, it would be nearer fulfilling a useful purpose than it can at present claim to do.*

To the second one must also demur. It is at least open to question that History "in the highest sense of the word" is merely "the study of the development and organization of the State in all its varied forms." It is all that, and far more. History in the highest sense of the word has deeper sources and wider issues than can be included in any such cursory definition. History in the highest sense of the word is the study of the conflicting ideals and philosophies of life, typified for us by dominant races—by Greek, Latin, Celt, Teuton, Slav, and Oriental. Its great ideal is not the old world imperium of one over all, but the modern concept of the solidarity of all in mutual respect and concurrent action.

Thirdly, it is matter for no small wonder that anyone should feel called upon to defer to such a very "vague sentiment" as that boys should know "something of the history of their own country," even to the limited extent of conceding two hours a week to the study of it!

As to the final statement, one is familiar—only too

* *Cf.* page 127, where an example is given.

familiar—with the argument as applied to the Grammar drill of the schools, but it is startling to find it thus boldly put forward in defence of the study of a subject which should be, before all others, instinct with human interest. There is a show of reason in the argument for exercising young boys in the subtleties of Latin Grammar—Language, even when its real purpose as the key to the thought and literature of a nation is kept well in view, does certainly demand that a very considerable amount of time and attention be given to intricacies of construction and form—but History appeals from first to last to the imagination and the intellectual sympathies, or it has no power of appeal at all. Those who have a real appreciation of its cultural value must turn impatiently from this application of the threadbare argument, that what is without any real human significance may yet have a certain artificial value as mental gymnastics! Many who regard History as the guiding thread which leads through arid wastes of intellectual speculation to the deep, full sources of human motive and action, may, in view of the practical difficulties in the way of its literary treatment in schools, be forced to the conclusion that it is a study which had better be left altogether to the later years: they may come to think that the higher and permanent interest of History is impossible to the young intelligence; and, if elementary guiding principles are disregarded, this is undoubtedly true.

But let us clear the ground once and for all of these arguments in favour of the study of History as a means of training the powers of attention, observation, &c. Either it has a high cultural value of its own, which amply justifies its literary treatment from the first; either it is vitally important as connecting the possibilities of the present and future with the discoveries, triumphs, and failures of the past; or we can afford to disregard it altogether, and let a dead past bury its dead. Every study pursued with an intelligent recognition of its intrinsic value

quickens the powers of observation, attention, and reasoning, but it only does so when these powers are exercised naturally upon real issues. Just as the unconscious exercise of the limbs of children at play results in a general increase of physical strength and vitality, so a general increase of mental vigour results from free exercise of the intellectual faculties on natural interests. The results will bear comparison with the utmost benefits to be derived from any artificially-imposed exercise of the faculties, with a view to their better development, as well as the luxuriant blossoms of June bear comparison with the pale buds of winter forcing-houses.

The first principles of History have already been defined as two-fold :—1. Those which should control the purely intellectual desire for objective knowledge, showing the Greek, Roman, Celtic, and Teutonic races as distinct types in their physical appearance, works, pleasures, and ideas of right and wrong. 2. Those which are purely Ethical or philosophic in their revelations, and deal exclusively with the social order resulting from the union or balance of the peculiar powers of each race.

One is aware that such a definition does not carry with it the same conviction as, for instance, the definition of the first principles of Geography as direction, distance, and level. Fuller explanation and illustration is therefore required before their importance as first principles will be admitted at all.

2. Historical Presentment determined by the Phases of Growth. There may be said to be three great epochs or phases, in the physical and mental development of the civilized Western child, which correspond curiously closely to the great phases in the gradual development of Western civilization. These phases should determine the mental as well as the physical exercises of the child. As his bodily health depends on the nourishment and exercise he is

allowed, having due regard to his growing powers of assimilation and expenditure of energy, so his vigorous or weakly intellectual development depends largely upon wise or unwise response to the intellectual needs of each successive phase. The physical powers and corresponding intellectual capacity of the three periods are indicated below :—

PHASE I.

Physical condition.	*Intellectual capacity.*
Continuous rapid development of physical strength. Short periods of sustained mental activity.	Conscious delight in physical excitement. Sense of wonder.

PHASE II.

Gradual adjustment of physical activity to external suggestion, *i.e.*, skill. Longer periods of sustained mental activity.	Growing sense of order and sequence.

PHASE III.

Rapid, continuous adjustment of physical ability to intellectual purposes. Prolonged highly-complex mental activity.	Conscious intellectual effort. Ethical sense—Right for right's sake.

Comparison with the history of any civilized Western people will show that these phases are passed through alike by the race and the individual :—

PHASE I., which indicates the physical and mental states of the child from birth to eight or ten years of age, corresponds closely to the childhood of the race. Feats of extraordinary strength, intense pleasure in movement and physical excitement, unreasoning love of the mysterious and weird, which is as yet more a physical sensation than a conscious intellectual emotion, are the delights of a primitive people as revealed in their Hero-tales, Myths, Legends, and of the child as revealed in his love of story, song, and movement.

PHASE II. covers the period from eight or ten, to the fourteenth or sixteenth years of the child's life, and corresponds to the early civilization of the race, best illustrated by the pleasures and purposes of feudal and chivalrous times. Mere exercise of physical strength for its own sake no longer suffices. Restless wonder gives way to a growing desire for order and some kind of fixity of purpose. Longer periods of sustained and far more complex mental activity govern the movements of the child and the race, and a certain rapid adjustment of the physical powers to external suggestion, which we call skill, marks the physical advance. A purely intellectual desire for order and solidarity in human affairs naturally results from this higher capacity for sustained mental action. Exuberant, conscious delight in physical excitement is still high, but is no longer an end in itself.

PHASE III. covers the years from fourteen to eighteen, or from sixteen to twenty, of the life of the individual, and corresponds in a remarkable degree to the period of intellectual effort of the race. Intense intellectual activity, followed by long periods of apathy after strain, marks the youth or early manhood of the race and the individual.

Here, then, we have natural laws which should determine the scheme of Historical or Literary instruction as definitely as they determine healthy physical growth. Recognition of these laws at once defines the aim, and indicates the method of modern History instruction. Having realized that to each age belongs its own natural interest, to which History can and must appeal, it remains only to discover by practical tests :—1. What is the material which appeals directly to the natural interests of the different ages? 2. What is the order and method by which it should be presented, so that it may yield the highest ultimate cultural value?

The first question is readily answered. During the first period the child must be nourished by the food which the wise, unconscious instinct of the race has provided for itself —Legend, Hero-tale, and Myth must accomplish their work of storing the imagination, quickening and extending the sympathies. The far-reaching results of the union of Norse strength and Latin power of organization so brilliantly manifest in the pages of William of Jumieges, William of Poictiers, Orderic, Wace, and other annals of the Norman Dominion, give a wealth of material suitable to the physical and mental development of the second period. While the new learning—Elizabethan enterprise, Stuart misrule, the Revolution, XVIIIth. century apathy, and XIXth. century progress, illustrate the struggles of the race, which are naturally interesting to the healthy adolescent mind.

The second question, What is the order and method in which historical material shall be presented, so that it yield its highest ultimate cultural value, needs fuller explanation.

It must be remembered that the child's interest at each age is transitory. This is in the nature of things, and indicates the necessity for working the natural inclination, at the right moment, for all it is worth. The transitory interest must be used to develop a humanist idea of permanent value which shall assist in every subsequent development of the subject. A cursory comparison of the natural interests of classes of children of eight, twelve, and sixteen, brings out strikingly the advantages of making full use of each successive phase. For example, it is as unreasonable to hope to interest a child of eight in the motives which led to the signing of the Great Charter as to expect him to show an eager desire to understand the policy of Prince Bismarck in 1878. The one is as incomprehensible as the other, because both belong to an intellectual development of the race which is far in advance of the intellectual development of the individual. It is equally unreasonable to expect him

to be interested in the military manœuvres which prove fascinating to a boy of fourteen, who has begun to take pride in the use of tools, or weapons of one sort or another. This kind of mistake is frequently made, and foredooms the liveliest efforts to failure. One must not therefore suppose that the real interests of History are impossible to young children. The real interests of a period far in advance of the child's own development *are* impossible to him; but here the richness and variety of historical material at our command should save us from being forced into premature or mistaken action. Feats of physical strength, the elements of the marvellous and mysterious which abound in early Western Myth and Legend, appeal to the child's actual emotions, and fascinate him. This fascination will act as a charm in impressing the picture of a type upon his mind, which will endure long after the early glamour has been superseded by the more varied and extended interests of later years. Many of the difficulties of History teaching are, after all, artificial; strict adherence to the natural order clears the ground in a surprising way.

One is aware that the objection may here be urged that myth and legend are not History: you cannot feed a child upon a conglomerate mass of early monastic fables or pagan hero-tales without doing a permanent injury to his sense of historical reality and chronological sequence, murmurs the critic—himself absorbed in the importance of deciding such questions as whether or not the divinity assimilated to Dis Pater, of the Prémeaux bronze, is the Pluto of the Romans or the God of the hammer of early Gallic numismatics. The reply is, that the sense of historical reality and true chronological sequence belong to a subsequent period as completely as the interest of his own speculations belongs to a late and complex scholastic development. The needs of the higher criticism are emphatically not the needs of the young child. It is quite true that myth and legend are not History: but it is equally true that they preceded History

in the natural development of the race, and must do so in the healthy natural development of the individual.

So imperative is this appetite of the early years that we perforce concede to it a diet of fairy tales and animal fables in the pages of Grimm and Æsop—a diet which is certainly better than starvation, but which loads the intellectual system with waste products, and much resembles the physical error of feeding a child on sweetmeats when he should be assimilating bread and milk.

The ultimate cultural value of myth and legend should not require defence. As the temperament of a child is indicated by the character of his pursuits and the stories he really enjoys, so the temper of a people is revealed in its Myth and Legend. The details of food, dress, ornament, superstition, and custom, crowding the pages of hero-tales and early monastic chronicles, are intimate, quite unconscious, self-revelations of the mind of the race. The actual temper of a people is here far more plainly shown than in the study of their laws. Written laws are the expression of the reasoned efforts towards an ideal of a people who have become self-conscious: myth and legend are the spontaneous expression of their actual habits and their unconscious, unreasoned preferences. A child follows eagerly incident and detail taken from early Celtic and Germanic MSS., such as the Tain Bo-Cualgne, the Leabhar na H-Uidhre, the Fair of Carman, the Icelandic Sagas, Beowulf, our own Cædmon, and the Saxon Chronicle; but he is of course quite unaware that he is storing his mind with material which in time to come will enable him to draw conclusions and generalize with some degree of accuracy on all subsequent issues of Western History; at least upon all those which have resulted from the conflict of interests of dominant races. Those among us, however, who have come to realize only late in life the importance of these subtle, elusive, but all-compelling race tendencies, know by stern experience how impossible it is to make up for the loss of the early years.

Without an intimate acquaintance with the legendary lore of dominant European races, that quick, intuitive understanding of the temper of a people, which recognises at once the real sympathy or antagonism underlying this or that plausible explanation of a 'policy,' is impossible. To acquire this intimate acquaintance when the age of healthy natural appetite for it is past, is well-nigh impossible. To the average man or woman details of early civilization—of the food, dress, arms, and customs of primitive peoples—are wearisome ; the interest of such details is purely archæological. But the child of six or eight, who throws overboard with short shrift any antiquarian ballast with which a mistaken enthusiast may attempt to load the 'story' for which he clamours, will fasten with avidity upon every minute detail really descriptive of the habits and powers of a people whose exuberant delight in physical strength, primary colour, and the marvellous, renders them strangely fascinating, and easily understood by the light of his own restless desires and inconsequent love of movement and mystery.

Yet in the majority of cases these invaluable first years are entirely neglected. Many of us go through life with one side of our intelligence permanently atrophied. The result of starving the healthy natural appetite of the first years is seen, as time goes on, in feeble, or altogether negligible, powers of imagination, and a total inability to understand, or often even to tolerate, emotions, customs, and opinions which are not those of our immediate environment.

At eight or ten years of age the child enters upon what we are pleased to call the elementary "literary" instruction of school life, furnished at best with a few carefully remembered conclusions, involving ideas quite beyond his natural powers of comprehension, relative to Roman military organization and Greek skill. These conclusions stand to him in lieu of the mind-picture of Roman and Greek types which might have been easily and permanently impressed

upon him by Greek and Roman myths, stories from Cæsar, Tacitus and Pliny, the glorious legends of the Iliad and Odyssey, and by reproductions of the perfect art forms of the Golden Age of Greece and Etruria. A child who knows even some few of the many lovely forms Etruscan excavations have shown us, as the actual achievements of one of the great provinces absorbed by the Roman Empire; who can recognise the low, broad brow, the trained strength, and sensuous grace of the Discobolus, as typically Greek, has a finer understanding of the real elements of modern Classic History than one who can give the dates of all the Punic wars, but cannot distinguish between a Roman "toga" and a Celtic "cochal"! Only the child who has been nurtured on Celtic hero-tale and myth, on the beautiful legendary lives of the Western saints, who has been caught and held by some few of the crisp aphorisms of a Cadoc, scorched by the fiery zeal of VIth. century bards, or has pored over the intricate beauty of design of the early Celtic miniatures, can have any conception of what was the real historical disaster of the flight of the Celt and the fall of Romano-Celtic civilizations before the invading Northmen. Only after he has passed on into the magnificent gloom of Norse mythology, and shuddered at the grim fatalism which peopled Asgard and Nifleheim with Nornir and Nature Gods, can he really understand what sent the Teuton fearless into the great theatre of race conflict, and what were the real modifications achieved by Celtic and Classic pioneers of Christianity and civilization.

The material for the second stage requires much less careful selection, because it has a known historical sequence. We all remember with what power tales of chivalry of the Xth. to the XIVth. century appealed to us as children of twelve or fourteen years of age, which would bore us to extinction were we condemned to read them now; yet the picture of crusader, monk, and minstrel so formed, remain part of the permanent furniture of the mind, long after the

real interest of history is centred for us in philosophical and ethical consideration of a nation's constitutional development. We must at this stage guard carefully against any temptation to force our own higher conceptions of historical interest upon the growing mind. A youth of awakened intelligence may follow with interest at sixteen or eighteen the development of the Norman constitution in the pages of Stubbs, Freeman, Lingard, or Green; but we must not expect a boy or girl of fourteen to do so. What we may hope to do is, by wise use of the personal charm of stirring biographies of men like William I., Lanfranc, Anselm, and contemporary leaders of the Norman feudal order, to furnish the mind with a mass of brilliant representative incidents which will serve as data for the philosophical deductions of a later stage. Any intelligent boy or girl will show enthusiastic appreciation of the daring, the resource, the perseverance, and the lavish strength displayed at Mortemer and Varaville, at Senlac, in the harrying of the North, and in the Councils of Westminster. But we must not expect them to be interested in the constitutional order which is the natural result of the exercise of these very qualities. This interest appeals to a much later development of their intelligence. Enough — amply enough — if they realize vividly and sympathize with the passions and desires of the moment controlling the various incidents which do appeal to them.

The final development is the natural result of the perfected sense of order and sequence of the preceding stage. In this latest phase very little direction is required. The boy who has been through the two first periods in the right way, finds himself equipped with a faculty of selection which may safely be left to take care of itself. No more direction and supervision should be needed for the literary studies of a healthy youth of sixteen or eighteen, who has made full use of his early years, than is required for his physical exercises. The opportunities afforded by the Sixth

Form of a Public School, and by the University, amply suffice. Where any detailed supervision is necessary at this age, it argues imperfect development, consequent on defective or actively bad treatment in early years; the most that should be necessary is a certain amount of suggestion and encouragement. The ethical sense, or love of Right for Right's sake, cannot be given at the last moment. It is the final perfect result of a continuous healthy moral and intellectual development. Of course there are cases—unhappily only too numerous—of extremely weak or backward development, consequent upon constitutional defect of one kind or another, which require special treatment from the first; these are not under consideration. What has been said has had reference throughout to the normal, average boy of the professional classes. But it will be readily admitted that, though the exceptionally backward boy requires special legislation, neither he nor his exceptionally brilliant brother can do anything but benefit by improved methods based on rational principles.

3. For Literary Matter, Literary Methods. Those who admit the advisability of a literary method in harmony with verifiable natural laws, may yet recoil from the practical difficulties they see in the way. Obviously, if History is to be taught by literary presentment of its raw material at the right moment, the work of the teacher must be, to a very great extent, a work of selection, which necessitates a certain amount of literary instinct, critical faculty, and leisure for their exercise. How is the overworked schoolmaster—even supposing he has the required faculty—to find time for this work of selection and arrangement? As things are, it must be frankly admitted, he cannot. The man who teaches History, together with half a dozen other subjects not specially his own, is, with his unhappy victims, entirely at the mercy of existing textbooks. The results we know only too well. They are

well exemplified by the case I lately heard of a boy of eighteen from one of our large Public Schools, well up to the average in intelligence and physique, who was "spun" in a written exam. because he mixed Mary Stuart with Mary Tudor in such a way as to convince his examiner that he had not the remotest idea

> "What the difference *could* be,
> 'Twixt Tweedledum and Tweedledee."

He, in fact, was one of the large majority of average schoolboys who leave school with the vaguest ideas even of the leading events in the History of their own country, and in total ignorance of the real principles and possibilities of the study.

It is certainly inevitable, if we would change all this and attain to a moderate degree of literary excellence, that History should be taught—like the Fine Arts—by teachers who are specialists. Undoubtedly the modern tendency is to specialize in all directions : a tendency which is at once the symptom of, and itself responds to, the need of a complex civilization. This is, however, only another way of saying that we cannot get good work unless we pay for it; and upon the general practical recognition of this truism, as applied to education, depends the success of the whole cause of reform.

The importance of presenting only such historical material as is suited to the child's actual physical and mental development, does not seem to have received due consideration, even in the strongholds of educational reform. Three years ago, a series of lectures on Herbartian methods was given in London, to English teachers. The Lecturer began his admirable explanation of German methods of applying psychological laws to practical teaching, by the statement that the common sense of Humanity is a basis for the Ethics of education ; and every example and fresh development of his subject illustrated the truth of this statement, with one remarkable exception. He gave as an

historical example the difficulty of making children realize that our forefathers came from the East. How shall we do this? he asked. Firstly let them use the map. Let them see England: ask who lives in it?—the English people. Who are the English people? Themselves, their fathers and mothers. Have English people always lived in England? and so on. Five or ten minutes spent in these familiar questions, the Lecturer assured us, will set the children upon "questioning the past." We shall have established "continuity of ideas" thereby.

Shall we? Can the young child for whom the idea of his forefathers coming from the East is "difficult," use a map to any satisfactory purpose? If he can use a map so that seeing a place upon it gives him a really clear idea of its direction with regard to some other place, the idea of his forefathers coming from the East to the West is really no more difficult than the idea of his sister coming from the nursery to the drawing-room. If he cannot, the map will not help to establish "continuity of ideas." Neither is there any natural connection between English people as represented to him by his father or mother and the early English of the Peninsula. All this is artificial. The plain fact is that the child is not naturally interested, does not really care from whence his forefathers came. But he *is* naturally interested in the actions and sufferings of men and women whose desires and emotions correspond to his own. Until, by means of pictures, stories, songs, poems, you have thrilled him with emotions of affection and antagonism for actual men and women who have lived before him, he will *not* begin to "question the past." Any sense of continuity that can be established at this stage is not, rightly speaking, a continuity of "ideas" at all. It is a continuity of emotions, not at all understood, but felt. By an appeal to the child's love of movement and mystery you can interest him in the appearance, words, and works of his primitive ancestors; when he knows them personally,

he will begin to question from whence they came, and what is their relation to himself; but not before. What will naturally interest the young child in the English Conquest are the evidences of the peculiar force and courage of a Teutonic people at issue with Celtic and Classic romanticism and refinement. Here the conflict of race interest corresponds to the conflict of his own physical exuberance with his more refined emotions, which is perfectly familiar to him.

4. History of the Nation's Thought and Growth the Essence of Humanist Instruction. It is, of course, obvious that the purely literary treatment of History advocated in this chapter is not a special preparation for the study of History as an exact science. But what is claimed is, that this method will give clear ideas of the chief epochs of national progress, and their main factors, which will become part of the permanent possessions of the mind. The science of History—*i.e.*, exact historical knowledge resulting from the critical examination, not only of historical authorities and state papers, but of archæological material of all kinds, and the careful balance of such original evidence — must, by reason of the exceptional opportunities and the fine critical sense required for it, be the pursuit of a distinguished minority. It is not in the nature of things that it should ever be interesting to the average man; and this little book treats of educational methods which have been designed throughout for the average boy of the professional classes. History as the head and front of Humanist instruction has a peculiarly broad, cultural value; but, as now taught in schools, it is certainly not Science—the average boy, not to speak of the average man, is unaware what is the basis of the historical statement he accepts: still less is it Literature—the pernicious system of condensing into short paragraphs as many isolated, and often quite unauthenticated, facts about

a nation's art, literature, industry, and police, as it is deemed possible for a boy to memorize and retain over an examination, leads to frequent grossly inadequate statements, and a style calculated to repel anyone with even the most modest sense of literary form. If we except Language teaching, which has been thoroughly systematized, and is therefore really effective, it may be truly said that there is not any branch of Humanist instruction which would not be radically affected by reformed methods of History teaching. The treatment of History here advocated would bring boys into direct contact with the original literary, artistic, industrial, and speculative works of the nations with whose general development they are concerned, at the moment in their own psychological and physical progress when assimilation of the ideas presented is possible.

To realize the importance of such a revolution, one must first recognise clearly the fact of a widely prevailing and profound indifference among men of the professional classes, to what may be broadly termed literary and artistic interests. Artistically, as a nation, we simply do not count. It is a significant fact that, though the methods of our Royal Academy of Arts make us the laughing stock of the continental schools, its products, nevertheless, more than satisfy the needs of an 'educated' British Public. The indifference of the average man is due to the fact that 'literary' and 'artistic' is for him synonymous with 'unpractical.' He will read, with effort, such novels by Meredith as give him what he believes to be a true description of a social order into which he may or may not enter at some future time; such poems of Browning as deal with human passion and pain—even, if he has boys to educate, Matthew Arnold on Schools and Universities—because he believes he is reading the candid expressions of men of superior culture on problems or emotions which are in some sort his own. But he would yawn over Tiresias, and openly protest were any attempt made to interest him in the critical works of the same author.

The beauty of the most exquisite resettings of peculiarly representative Italian and German legends by the master hand of a great poet, whom in certain broadly human phases he can admire and love, eludes him as completely as the delicate sentiment of a Greuze, or the classic perfection of a Meissonier. Confront such a man with the loveliest bronze work of Monreale, Trani, and Ravello; with the purest forms of early Greek and Etruscan art; and, if he is honest, he will confess that to him they are so much old metal and earthenware. Indeed it is hard to see how it could be otherwise. We cannot feel enthusiasm for what we do not understand; and we cannot understand without long and familiar intercourse with the things to be understood.

This is just what our current educational system denies to the children of the professional classes. They may or may not have opportunities of becoming familiar with really fine specimens of the world's Art and Literature in their private life; but they certainly have not any such opportunities in the schools in which so much of their time is spent. Our Art treasures, original MSS., and antique collections, are kept in the solemn seclusion of the great buildings which we dignify by the name of National Museums, but practically regard as national lumber rooms. Good reproductions are expensive (chiefly because of the extremely limited demand for them), originals inaccessible; so we hang the walls of our schoolrooms with bad maps and worse diagrams of Natural History, and it results that the spaces are filled in with ink spots and the various rude disfigurements one associates with any room inhabited by a number of boys. We admit readily the "refining influences" of artistic surroundings, but—hang our schoolrooms with good reproductions of early Greek and Celtic art? Absurd, my dear Sir! you cannot have realized what young savages schoolboys are! Unfortunately it is but too clearly demonstrated; and also what savages complete ignorance of Art and Literature at first hand is likely

to leave them! The schoolboy, on the rare occasions when he is to be seen wandering wistful and bewildered through the National Gallery or the British Museum, is a melancholy example of wasted opportunities. Long familiarity with bare walls, hard forms, and hated desks, has left him little natural power of appreciation of any art higher than the comfortably decorative, which prevails in the decently appointed homes of the professional class to which he belongs. The romance of life centres for him in the cricket and football field. The pleasures of life are the pleasures of the senses. These he knows; they are easy, because familiar to him. The pleasures of the intellect he has to begin to acquire; and already his life is full of "practical," which too often really means "material" interests, and much of his time is given up to the stern exigencies of modern examinations. What wonder that the higher effort is very rarely made!

There is an unpleasant ring of truth in a remark which was made to me the other day by a well-known French artist.

"The attitude of the average Englishman towards art," he said, "is that of the purchaser of silk or fine linen on entering an Eastern bazaar. He sees some things he likes, some things he does not like, much that he knows is valuable, much he knows is worthless; but he does not in the least know *why*. He is rightly very much afraid of being taken in. All, the best and the worst, he knows he can buy with money. Therefore he thinks it is well, all the same, to have concentrated the attention from the first on getting money, for it is better to have without understanding, than to understand without the power of having."

What he never realizes is that though money can purchase good books, music, statuary, pictures, it cannot, at the last moment, purchase the perceptions necessary to enjoy them. These must grow with the growth and strengthen with the strength. Familiarity from the first

with really fine examples of the world's Art and Literature, specially adapted to the peculiar needs of each successive development of the growing mind, is necessary to enable a man ultimately to enjoy the best. One meets but too often the youth who is "rather musical," has "artistic leanings," or a "literary turn," and insists strongly upon his "views" about his speciality, and one objects to him for what he is—a spurious product. But the man or woman to whom a certain amount of pure Art and Literature is as necessary as fresh air and sunshine, is unfortunately a charming exception, which might nevertheless be the rule.

Yet all have passed through periods when the finer sensibilities have laid imperative claim to their due share of the higher thought and effort of the race, but the claim has too often been slighted or ignored. Have you ever taken a young child to a picture gallery and listened to his candid expressions of pleasure? Yes, you may reply, and have often observed the delight he shows at some crude daub, and the indifference with which he passes by really good work. But consider a moment what it is that the child likes in a picture that the trained intelligence recognises as worthless. It is invariably one or both of two things,—pure colour and dramatic incident. Now, pure colour and dramatic incident are two great essentials of good Art (*pace* the modern school of Impressionism), and to say that the child is not repelled by the fact that the work is 'painty,' and the sentiment 'banal,' is only to say that his critical sense is not yet awake. He sees something which responds to a real need, and he is not affected by deficiencies which shock higher sensibilities. This does not mean that one is justified in encouraging a child to look at bad pictures because he may take pleasure in their bright colour and lively incident; but it does indicate that, in the good pictures selected for him, there must be plenty of bright colour and movement, or they will not appeal to him. You must

give him what he wants, and go on giving it till he wants something else as well. A very few examples will teach him readily to prefer really pure colour and fine incident, to work which is 'painty' and trivial.

In this, as in all things, we needs must love the highest when we see it, but it is necessary that we should see it often, and see it clearly. A History course which aims at unfolding at the right moment in the child's natural development, the original Art and Thought of Western races, should keep this highest continually before the growing mind. The raw material of History is also the raw material of Art—a fact difficult to realize by those who have been nourished only on the 'dry bones' of history, but none the less true. Even our best directed efforts to familiarize the young with good pictures and good books constantly fail, because we do not know how to select for them, and we will not learn from what they select for themselves. It is unfair to conclude that a child is incapable of artistic emotion because, without any previous familiarity with pure colour and form, he fails to appreciate the subdued sadness of a Corot, or the dreamy beauty of a Claude Lorraine, and that therefore he requires nothing better in the way of colour and sentiment than he can find in the toy-books of Messrs. Nesbit or Raphael Tuck. Yet this is the kind of mistake we frequently make. What we have to do is to give him what he wants *when* he wants it, and to give freely of the best. His needs will grow apace. As his finer perceptions are well and wisely cultivated, he will develop definite though often unconscious ideals of artistic excellence; and his interest in the lives and influence of great artists on their particular age will be strongly accentuated, in proportion as he is familiar with their works.

> "Whene'er a noble deed is wrought,
> Whene'er is spoken a noble thought,
> Our hearts in glad surprise
> To higher levels rise,"

is true, but only of the noble deed or thought which

appeals to formed powers of understanding. The deed or thought of a Western poet or painter, be it ever so noble, has no power of appeal to an Afridi tribesman; nor the conclusion of the philosopher or critic, be they ever so wise, to the young child. Only a very much more generous, enlightened, and ordered system of Humanist instruction can make it possible for all men to say what can now be truly said only by a privileged few, when in presence of the great achievements of human genius :—

> "The Tidal wave of deeper Souls,
> Into our inmost being rolls,
> And lifts us unawares,
> Out of all meaner cares."

5. The Raw Material of History is the Raw Material of Art. The following short analysis of the material chosen for the first period, and published in Chapter VII. of this little book, should make clear the seemingly rather arbitrary statement that the raw material of History is also the raw material of Art. The raw material for the Celtic epoch consists of:—Specimens of early Celtic arms, metal work, dress, ornament, pictures and plans of strongholds and houses, pictures of priests, warriors, workers, and slaves. Translations of original MSS., such as the Tain-Bo-Cualgne, the Leabhar na H-Uidhre, the Fair of Carman, Tacitus' account of the attack on the Druids under Paulinus Suetonius, for the Pagan period; and the Tripartite Life and Adamnan's Columba, for the post-Patrician or Christian period.

Four definite ideas about the Celt are necessary in order that the word shall be more than an empty sound or a vague puzzle to the child :—1. His physical appearance. 2. His works. 3. His likes and dislikes. 4. His ideas of right and wrong. They may be easily given from the above material as follows :—

1. The physical appearance of Celtic people will be represented to the child by reproductions of the Gallic

warriors on the column of Antoninus, now in the Louvre; the fine torque-encircled head of the "Dying Gladiator;" and by Ingcel's marvellous descriptions of Celtic kings and warriors, in the Bruighean Daderga.

2. His actual works are represented by pictures, and, where possible, by original specimens of Celtic arms, shields, spears, swords, and rock carving. Spinning, weaving, and dyeing processes, illustrated by such legends as those, give the miracles of S. Ciaran of Sagher, which, while amusing and stimulating the interest of the child, give perfectly definite ideas of the actual processes.
3. The likes and dislikes of an imaginative pastoral people are easily shown in their own descriptive poems, such as the "Courtship of Créde and Cael." Roofs thatched with bright coloured feathers, sunny chambers, silken hangings, curious carving of lintels, couches and bed-posts, gold and silver goblets, and jewelled arms, are details which delight alike the primitive poet and the young child. Passages which describe the warrior's dress and arms, and the women's embroidered robes, occur frequently in all the stories of the "Tain-Bo-Cualgne" and the "Leabhar na H-Uidhre," and I know by practical experiment that they are eagerly assimilated by a very young class.
4. The child's ideas of the moral laws of a primitive people are necessarily more shadowy—1st, because of the paucity of original material, legendary or historical; 2nd, because of the child's own low moral development. But a study of the laws and customs governing great assemblies of pastoral tribes, like the triennial "Fair" of Carman, the accounts of Cæsar and Tacitus of the functions of the Druid, given in conjunction with pictures of Cromlechs and Cairns, with the references to their uses from Celtic MSS., are definite as far as they go.

Now let us consider the broad cultural issues of such a set of lessons. The child has had before him day by day really beautiful forms of early military art,—the bossed shield, graceful spears and curved blades, which illustrate the hero-tales of the Tain-Bo-Cualgne. He is familiar with some of the rude but powerful conceptions of Roman sculpture, and with the delicate workmanship of early Celtic decorative art—twisted "torques," embossed sheaths, quaint hair discs, and "Budnhe," pins and brooches. He can recognise in the spirals and plaited tracery of Celtic rock carvings, and the Runic Crosses of Scotland and Scandinavia, the primitive sources of the elaborate designs of the Irlando-Anglo-Saxon miniature painters. If we allow the cultural value of Art at all, we must allow the cultural influence of such material on the growing mind.

Here is a passage from the Bruighean Daderga, descriptive of a Celtic warrior type :—

"I saw a tall illustrious chief,
Full waxing in the spring-tide of dazzling beauty,
Of features gentle, yet of proportions bold.
I saw his two bluish-white cheeks
Dazzling white and like unto the dawn
Upon the stainless colour of snow,
Under an arbor of Chafer black eye-lashes."

.

"I saw the splendid *Ardroth*
Encircling his head, enwreathing
With his hair its sheen of brightness,
The sheen of gold most brilliant
Above his curling yellow locks."

.

"I saw his splendid linen kilt,
With its striped silken border."

.

"I saw his many-hued red cloak of lustrous silk,
With its gorgeous ornamentation of precious gold
bespangled upon its surface,
With its flowing capes, dexterously embroidered.
I saw in it a great broach,
The long pin was of pure gold.

Bright shining like a full moon
Was its ring all round—a crimson-gemmed circlet,
Of round sparkling pebbles,
Filling the fine front of his noble breast
Atwixt his well-proportioned fair shoulders."

This is a detailed picture of a Celtic king, easily and eagerly understood by children familiar with pictures of the arms and ornaments therein mentioned. It is also noble poetry, and true, if primitive, Art. Children are moved by such passages with wonder, admiration, and expectancy. I can see, as I write, the eager up-turned faces of a class of children of 8—9 when the above passage was read to them, towards the close of a lesson on Celtic dress and weapons; and months after, small details of the picture were remembered and aptly used by them to illustrate some similarity or difference in another lesson. Children whose imaginations are thus early stocked with the many beautiful legends and descriptions to be found in early Celtic and Teutonic MSS., acquire all unconsciously, and without any but healthy and pleasurable effort, high powers of discrimination between what is genuine and what is mere convention in Art.

Compare the above passage with the carefully-sifted "Information" of the text-book. Here is a specimen from a well-known, and alas! much used, "*Historical Reader*:"—

"The Britons were a bold and hardy set of people, but living in a wild and savage state. They did not dress as we do, but clothed themselves with the skins of animals; and they were very fond of painting themselves with the juice of a plant called woad, which left blue stains upon their bodies. For food they ate the flesh of animals that they could kill in the forests, and they also ate the wild fruit and berries that they found in the woods. Some of the Britons kept cattle, and lived upon milk and the flesh of their herds. The Britons who lived near the sea in the South of the Island were not quite so wild as the people who lived in the North, for they knew how to plant wheat, and how to make better clothes from wool."

This is all beautifully concise and definite, and can be easily memorized by children. The only objections to it

are that it is not History—it is not even fact; it is not Literature; and it does not contain a single living, generative idea. What wonder that children fidget, yawn, and complain that they "hate History—it is so dry!" Yet this is all that ninety-nine out of every hundred children ever learn about one great branch of the Indo-Germanic race, whose peculiar characteristics, blending or at issue with complementary or opposed race-powers, have made European History what it is to-day.

Finally, we would point out that the literary treatment of History here advocated has in itself nothing subversive, or even unfamiliar; it has been applied to the Classics—the only branch of humanist instruction which has really been organised—since the XVth. century. Anyone pretending even to a modest degree of classical culture must know his Homer and Virgil; must have an intelligent acquaintance with the original narratives of Herodotus, Xenophon, Thucydides, and Plutarch; must be able to draw those general conclusions from the Homeric poems which, as Professor Mahaffy points out in his *Problems in Greek History*, are "fully warranted,"—*i.e.*, he must be able "to infer the political ideas prevalent when they were composed; the relative importance of King, Nobles, and Commons; the usages of peace and war; the life of men in its social side; the position of women and of slaves; the religious notions of the day; and such other questions as must be answered *if we desire to obtain a living picture of the people.*"*

This is the crux of the whole matter. *If* we desire to obtain a living picture of any people, there is but one way —intimate, familiar reference to original literature and original art. Professor Mahaffy, when he refers to the interest of researches in Greek pre-historic life, its relation to the East, and to the Homeric poems, speaks with the assurance of one who knows he has his public with him.

* *Italics* are ours.

We *have* desired to obtain a living picture of Greek and Roman civilizations, and have therefore cheerfully taken the necessary measures. We should not expect the writer of Greek history—not even the writer of a school history, of whom, verily, much is not required—to give us a narrative history of Greece, suppressing all quotation from original authorities, as well as all reference to Schliemann's excavations, and the work of the Hellenic Society! Quite otherwise. We are assured by Professor Mahaffy that the writer of Greek history is "bound to have visited Greece," and "in the fine illustrations now published of all the objects of interest in Greek Museums, and of the finest scenery throughout the country, the general public can find some equivalent."* He can refer us to the "Gallery of photographs begun by Mr. Stillman, and now in process of publication by the Hellenic Society," which are both more varied and less expensive than the "original and richly adorned volumes" of Dr. Schliemann on Mycenæ and Tiryns, and which will make "the treasures of Greece perfectly familiar to any student who chooses to acquire them."

But who expects the general public—even the general cultured public, or actual teachers of modern history in our public schools—to be intelligently acquainted with Celtic and Norse mythology and legend? From what are we to draw our general conclusions on the political ideas; the relative importance of peace and war; the life of man in its social side; the position of women and slaves; and the religious ideas of these two great branches of the human family, without which an intelligent understanding of the achievements of English, Norman, and modern Latin civilizations are impossible? Yet reference to the original material quoted in Chapter VI. will show that translations of all the finest specimens of early Celtic and Norse litera-

* Professor Mahaffy here appeals directly to a "general" public, not to a specially enlightened one.

ture, with copious illustrations of their art and industry, are easily accessible. There does not even stand in the way of a widespread acquaintance with the Western Classics, that difficulty of grammatical subtlety which makes the narrative of Thucydides "the special property of critical scholars." There is absolutely no reason why the brilliant hero-tales of the Tain Bo-Cualgne, with their wealth of descriptive detail and exuberant play of fancy, should not precede in our schools the study of the gloomy, titanesque mythology of the Northmen, so that the young child may have such a living picture of Celt and Northman as will stimulate his enjoyment and deepen his understanding of every subsequent epoch of Western History.

Chapter VI.

A HIGH STANDARD.

"Is not that the best education which joins to the mind and to the body all the force, all the beauty, and all the perfection of which they are capable?"—Plato.

1. A Liberal Education is a Balanced Education. In framing a curriculum, the first temptation which besets frail scholastic nature is to be encyclopædic. All knowledges are good; it is easy to make a case for any, and many such cases have been made. Nor is it always true that a little knowledge is a dangerous thing, so that its owner be aware how little it is. Ever so little knowledge of the real first principles of Chemistry, Physics, and Hygiene is better than none, because these can be applied; while a little knowledge of Greek or History cannot. The next danger is to give free rein to all one's pet preferences; and the third is to take some principle and ride it to death. The two former are the temptation of the amateur, the last of the professional. If the former be yielded to, the trail of the faddist will be over the whole curriculum; if the latter, some principles equally, if not more important, will be left out of account, and the curriculum will be classical, with a few reluctant hours of English History or Science; or technical, with dry Grammar lessons masquerading as Humanities. Some would-be reformers manage to unite both the faddist and the doctrinaire, and would add all kinds of fearsome items to the curriculum. I have heard of surveying, domestic economy, and even cookery being seriously proposed as part of a liberal education for boys of the class we are considering, and of their being given Latin

years, French years, German years, Greek years, and even (angels and ministers of grace defend us !) a Hebrew year.

Setting this kind of unpracticality aside, however, there is the high and ancient controversy between those who set use before culture, and those who set culture before use.

Perhaps the most forcible statement of the general principle that use comes before ornament is that by Herbert Spencer (*Education*, Chap. i., p. 8): and if to his program—assigning value in order to that instruction which (1) enables a boy to earn his living, (2) makes him a good citizen, and (3) a cultured man—there is added the undeniable fact that any and all subject matters can be taught so as to show each a part of the beauty and order of a growing world, and thus make for culture as well as for mental discipline, it almost seems that the true touchstone of educational value has been put in our hands.

But unexceptionable generalizations are often very hard to apply in detail. We must consider what are the exact wants of the particular class of boys (or girls) under consideration. What instruction best fits the son of a man in the higher walks of manufacture, commerce, or in professional life, to fill his place as worker, citizen, and gentleman ?

Certainly not knowledge only, even of the most "useful" matters: certainly not culture only, even reached by the devotion of years to the most "useless." Apart from the free unaffected manners, the sense of fair-play, the give and take, the manliness of thought, and the gentlemanly instincts, which are the strength of English public schools (all of which have little enough to do with the curriculum), there is a general breadth of mental view and tenacity of grasp which undeniably has in many cases followed (if we hesitate to say resulted from) a classical training.

Setting aside the somewhat hackneyed instance of our greatest dramatist, and the terse and vigorous English of some brilliant and notoriously non-classical scientific and

literary men of our own day, there can be no doubt that the cultivated taste of some of our best writers, the breadth of view of some of our wisest statesmen, and the scholarship of nearly all our great divines, have been nourished by a "classical" education.

If, however, these virtues are to be *ascribed* to it, then it might be expected that parochial politics and slipshod English would serve at once to mark out those who have not had the inestimable advantage of a classical training from those who have. If classical training pre-eminently gives intellectual interests, breadth, and scholarship, then these should be the distinguishing badge of those who are nurtured on the "Classics."

But these are precisely the characteristics wanting to large numbers among the upper middle classes brought up on this same intellectual diet. Their habitual reading, their tastes and habits, their political actions, their religious beliefs, alike make Matthew Arnold's charges of Philistinism unanswerable. Full of energy, healthy, prosperous, having neither the incentive of need nor that of taste to cause them to welcome ideas, they seek to impose themselves with all their prejudices and limitations, an endeavour, happily, always and necessarily defeated by their incompatibility.

Now, we all know enough science to be aware that constant causes do not produce variable results, and may perhaps fall back on Goethe's apothegm, that the human mind receives nothing (even from the Classics) that does not suit it; and possibly the cultured and scholarly minds which used the classics to such good purpose would have thrived equally well on the literary pabulum contained in the modern classics of their own and other tongues. Yet the fact remains that the sympathy which is learned by constant intercourse with the thoughts of great minds, and preferably with thoughts which the ages have seen to be worth preserving, which have stood the test of time, and, most valuable of all, are sufficiently remote from present

squabbles to awake no political or religious prejudices, is doubtless a powerfully humanizing agent.

These considerations alone would check the present writers in giving free play to their own temptation to set "The Faery Queene" and the "Idylls of the King" against Ovid's "Metamorphoses"; "Paradise Lost" and the lives of the Renascence explorers for Virgil; Addison for Cicero; Shakespeare for Horace, and Gibbon for Tacitus; and to supplement these with La Fontaine, Voltaire's historical work, Pascal, and Montesquieu or Montaigne.

But Lucian and Juvenal are no longer controversial, which cannot be said even of Milton, or Gibbon, or Montaigne. History and Philosophy cannot be studied in the mother tongue except as history and philosophy, and the latter at any rate belongs to a later mental stage. Studied in Latin or Greek, the learner, under guise of learning a language, is brought into contact with the great thoughts of those who have

> "Outsoared the shadow of our night;
> Envy and calumny, and hate and pain,
> Can touch them not."

Their lessons are not taught as lessons, and therefore are sometimes admired and occasionally remembered; and if familiarity with these can be made the end and acknowledged purpose of classical instruction, there is much to be said for it.

2. Allotment of Time. But this is only true of scholarly or thoughtful boys: emphatically not of the generality, to whom Virgil and Horace are just school "grind." Relatively few out of the vast numbers who leave our schools have any scholarship worth the name. So thoroughly is this the case that it is not seriously claimed that eighty or even ninety per cent. of the boys profit by their literary models; only that the grammar drill of the Latin sentence is good mental gymnastic for them. On

leaving school these pitch away their "classical models" with undisguised delight. How many grown men of the class we are considering read Homer, Horace, or Plato for relaxation from active life? We admire these names at a very respectful distance. But the grandeur of the diction, the refined play of ideas, and the lofty thought, are practically non-existent for those who neither read nor remember the authors themselves.

The truth is that the powerful aristocratic schools, which owe their popularity to quite other causes than the instruction they give, have yielded to modern pressure so far as to insert hours of English History, Geography, French, German, Science, and Drawing into a classical curriculum, but reluctantly, and without the belief in these which would lead to a treatment educationally valuable. Thus the once literary and scholarly cultivation of Greek and Latin has degenerated into mere linguistic readiness at "unseen" translation, and the venerable mantle of scholarship is patched with new cloth which might have been made into a fresh garment, but sorts remarkably ill with the old, whose rents are the more manifest. And these schools set the fashion and call the tune, while the "gentlemanly failures" and their parents pay the piper: and hence it has come about that the mass of "secondary" schools train under the presumption of an University stage to follow; they look for their triumphs and justification to the Honours Lists; and the 80 per cent. of average boys is sacrificed to the VI. form.

On this point the evidence of Matthew Arnold, a Rugby boy and Oxford scholar, the apostle of culture, all of whose preferences would make for a classical training, is decisive. He complains that "the great development of grammatical and linguistic studies at our schools, and their immense use of Latin and Greek composition, take so much of the pupil's time, that in nine cases out of every ten he has not any sense at all of Latin and Greek literature as literature, and

ends his studies without getting any; his verbal scholarship he is pretty sure in after life to drop, and then all his Greek and Latin is lost."*

The English system of instruction, unless it end with a B.A. and Honours, awakes no interests, and is in fact based on the old ideals of "the scholar and the gentleman" (of property, *bien entendu*), unfortunately and incompatibly modified by democratic competitive examinations, where the battle for individual supremacy is fought out with skilful answers to entirely academic questions. It has become chiefly fitted to enable the literary boy to beat rivals perhaps in other ways better equipped for the active service of their country: the refinements of Greek and Latin grammar are his drill ground, text-books are the territories laid out for his conquests, and the examination room is set as the scene of his triumphs. That he acquires culture may be admitted. His abilities take him through the long philological training to a real grasp of classical literature, and his linguistic studies find their natural end in a distinguished University career, leading to eminence in "the Church," at the Bar, in Letters, or (if he has family connections) in politics.

But the average boy who does not reach the VI. form, or who, with excellent abilities, has no literary tastes, is simply sacrificed to this flower of scholarship which our schoolmasters delight to honour. He, good honest lad, knows that he has no chance of distinction in the examinations, and as his interest cannot be aroused in matters which are by all around him regarded as means to an end, and not valuable for themselves, he concentrates his energy on football, and finally leaves school without intellectual interests, either Humanist or Realist, and admirably trained to fail at half a dozen different examinations. The stress of life may afterwards compel him to that grasp of real principles which is the basis of that "directive ability"

* *Higher Schools and Universities in Germany*, p. 167.

which the reformed schools of America make their acknowledged aim,* but assuredly his school instruction will not have given it him, and in many cases he never acquires it at all.

It becomes necessary, therefore, to seek for some means whereby the old familiarity with Humane letters, by whatever medium given, may be restored, and it seems that this may be best attained by returning to original material, both in the mother tongue and in "classical" instruction, finding the necessary time by beginning early, and dropping one of the literary languages.

Custom, against which, like stupidity, the gods themselves war in vain, has decreed that the one to go shall be Greek. Unfortunately there is in the whole world of letters no literature which is so Humanist, so suited in its gradations to the stages of the growing mind, so influential historically, and, in short, so completely educative as the Greek. The fables of Phædrus, the primitive personal mythology, the atmosphere of action and adventure of Homer, the simple narrative of the soldier Xenophon, the rich biographies of Plutarch, the humour of Aristophanes, the moral problems of Sophocles and Æschylus, the stately philosophy of Plato, stand alone. We are reduced to translations. A modern school course might perhaps set the Elizabethan drama against that of the age of Pericles, but it could not think of putting Descartes, Hamilton, Lecky, or Herbert Spencer for Plato; we must fall back on Jowett, and claim "*The Republic*" as an English classic.

But the mental gymnastic involved in dealing with the complex structure of the Latin sentence has gained the day, and the Latin language, whose Augustan and post-Augustan writers owed nearly all their polish and most of their ideas to the Greeks, is paramount.† Latin, therefore,

* Report of the Royal Commission of 1894, p. 343, Vol. VII.

† Can it be seriously maintained that if the present total of five hours a week for eight years—say 1,600 lessons in Latin grammar—were devoted to

must perforce be accepted as the first medium for *literæ humaniores* for middle-class boys, with English in the second place.

The principles to be carried into practice in a rational curriculum work down to four:—

(*a*) That language being useful as the channel for ideas, the linguistic instruction, whether in a living or a classic tongue, shall lead to real familiarity with literary models, and be thorough enough to be a key to national literature and thought.

(*b*) That this Humanist training shall be balanced by adequate scientific and mathematical training, dealing with real first principles.

(*c*) That time shall be allotted to subject matter in approximate order of its educational value.

(*d*) That handwork and music shall receive recognition.

It will now be shown how, with the 4½ hours in the earlier and 5, 6, or 7 hours in the later years as available daily time, these conditions can be fulfilled without overstrain, while allowing some time for those extensions of knowledge which are suggestive of interests for later life. There is room for all the matter of a liberal education if all be suitably and naturally treated.

These conditions we have endeavoured to give effect to in the annexed table and syllabus. *Vide* Scheme of Instruction, Table I., *opposite.*

The analysis of this table shows 4,860 lessons given to Humanist instruction; 2,640 to Mathematics, and 2,490 to Science; 1,620 to Handwork, including Drawing, and 1,470 to Music. This latter may seem large; it is so because the hours so used could not be transferred to brain work without violating the medical condition.

This table expresses a normal ideal. It can only be carried out in its entirety in the case of children whose eighth year

accuracy in English composition, that a "less mentally valuable result" would be attained. *Cf.* Greek education as purely national.

SCHEME OF INSTRUCTION.—TABLE I.

EXPLANATION.—The **numbers in leaded type** denote the successive School Terms from the age of 8 to 18. The **vertical columns** contain the number of Lessons devoted to each branch of instruction in each Term of 13 weeks, here conventionally taken as 10 weeks, to allow for Repetition, Examinations, Variation of Course, &c., &c. Hence the number of "Lessons per Term," in the last line, divided by 10 gives the number of Lessons per week—*e.g.*, Arithmetic 60 stands for 60 Lessons in the Term, or 6 in the week, 1 daily. The **last column** gives the total time devoted to any given branch in the entire Course; and the **Analysis**, the time devoted to Humanist, Realist, and other groups in each period respectively. The Periods from 12—15 and 15—18th are marked "Provisional" because the allotment of time here, as suitable to the average boy, has not yet been entirely proved, and is, strictly speaking, only given here as showing the sequence of instruction after the Period 8—12 years. For the third period boys should be able to select their studies.

| | Subject Matter. | Normal Age, 9th to 12th Years (Inclusive). Lessons ¾ Hour each. | | | | | | | | | | | | Normal Age, 13th to 15th Years (Inclusive). Lessons partly 1 Hour each. | | | | | | | | | Normal Age, 16th to 18th Years (Inclusive). Lessons mostly 1 Hour each. | | | | | | | | | | Total Lessons to each. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TERM | I. | II. | III. | IV. | V. | VI. | VII. | VIII. | IX. | X. | XI. | XII. | XIII. | XIV. | XV. | XVI. | XVII. | XVIII. | XIX. | XX. | XXI. | XXII. | XXIII. | XXIV. | XXV. | XXVI. | XXVII. | XXVIII. | XXIX. | XXX. | |
| | **Literæ Humaniores.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | English Comp. and Gram. ... | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 420 |
| 2 | History | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 000 |
| 3 | English Literature | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 180 |
| 4 | Latin | — | — | — | — | — | — | — | — | — | 90 | 90 | 90 | 60 | 60 | 60 | 60 | 60 | 60 | 50 | 50 | 50 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 1,320 |
| 5 | Latin History | — | — | — | — | — | — | — | — | — | — | — | — | 30 | 30 | 30 | 30 | 30 | 30 | Chiefly | Composition. | | — | — | — | — | — | — | — | — | — | 180 |
| 6 | Latin Literature | — | — | — | — | — | — | — | — | — | — | — | — | — | In Latin. | — | — | — | — | 20 | 20 | 20 | 20 | 20 | 20 | 50 | 50 | 50 | 50 | 50 | 50 | 420 |
| 7 | French | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 60 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 1,110 |
| 8 | French History | — | — | — | — | — | — | — | — | — | 10 | 10 | 10 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | — | — | — | — | — | — | 270 |
| 9 | French Literature | — | — | — | — | — | — | — | — | — | In French. | | — | — | — | — | — | — | — | — | — | — | — | — | — | 10 | 10 | 10 | 10 | 10 | 10 | 60 |
| | **Mathematics.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total Humanist Lessons..... 4,860 |
| 10 | Arithmetic | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 30 | 30 | 30 | 30 | 20 | 20 | 20 | 20 | 20 | 20 | — | — | — | — | — | — | — | — | — | — | — | — | 720 |
| 11 | Geometry | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | — | — | — | — | — | — | — | — | — | 420 |
| 12 | Algebra | — | — | — | — | — | — | — | — | 60 | 40 | 40 | 40 | 40 | 40 | 40 | 30 | 30 | 30 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 870 |
| 13 | Mechanics | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 20 | 20 | 20 | 20 | 20 | 20 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 390 |
| 14 | Trigonometry and Applied Mechanics | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | (Algebra applied to experimental results) — | — | — | — | — | — | 20 | 20 | 20 | 30 | 30 | 30 | 30 | 30 | 30 | 240 |
| | **Nature Subjects.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total Mathematical Lessons..... 2,640 |
| 15 | Geography | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 20 | 20 | 20 | 20 | 20 | 20 | — | — | — | — | — | — | — | — | — | 670 |
| 16 | Geology... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 20 | 20 | 20 | 10 | 10 | 10 | 10 | 10 | 10 | 120 |
| 17 | Botany * | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | — | — | — | — | — | — | — | — | — | (Physical Geography applied.) — | — | — | — | — | — | — | — | — | 120 |
| 18 | Biology | — | — | — | — | — | — | — | — | — | — | — | — | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10* | 10 | 10 | 10 | 10 | 10 | 20 | 20 | 20 | 20 | 210 |
| 19 | Physics | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 20 | 20 | 20 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 870 |
| 20 | Chemistry | — | — | — | — | — | — | — | — | — | — | — | — | (Hence forward mathematical in form.) 30 | 30 | 30 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 30 | 30 | 30 | 420 |
| 21 | Hygiene... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 90 |
| 22 | Economics | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 90 |
| | **Manual Expression.** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total Science Lessons..... 2,490 |
| 23 | Writing... | Half an hour daily for such as need it. | | | | | | | | | | | | Alternative to Work shop. | | | | | | | | | | | | | | | | | | |
| 24 | Workshop * | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 20* | 30* | 30* | 30* | 30* | 30* | 30* | 30 | 30 | 30 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 690 |
| 25 | Drawing | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | ?(20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20) | 930 |
| 26 | Music * | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | 60* | ?(30* | 30* | 30* | 20* | 20* | 20* | 20* | 20* | 20*) | 1,470 |
| 27 | Reading... | Children to read aloud in evenings three times a week. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total Handwork and Music Lessons... 3,090 |
| 28 | Religious Instruction * ... | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | 26 | |
| | Lessons per term of 10 weeks. (3 weeks' margin.) | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 320 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 400 | 400 | 400 | 420 | 420 | 420 | 420 | 420 | 420 | |

PROVISIONAL.

Analysis.

First Period, 8—12.

Humanities	1,740
Mathematics	1,020
Nature Subjects ...	840
Handwork	720
Music	720
Total ...	5,040

Second Period, 12—15.

Humanities	1,470
Mathematics	750
Nature Subjects ...	750
Handwork	540
Music	540
Total ...	4,050

Third Period, 15—18.

Humanities	1,650
Mathematics	870
Nature Subjects ...	900
Handwork ? ...	360
Music ?	210
Total ...	3,990

Totals by Subjects.

Humanities	4,860
Mathematics	2,640
Nature Subjects ...	2,490
Handwork	1,620
Music	1,470
Total ...	13,080

Totals by Periods.

1st Period: Lessons three-quarter hour	5,040
2nd Period: Lessons partly one hour each	4,050
3rd Period: Lessons mostly one hour each	3,990
Total ...	13,080

32 lessons of ¾ hour each per week of 6 days = 4 hours per day, exclusive of Workshop and Music, and of Botany, which is not a matter of set instruction.

* Not included in totals of weekly lessons 320—420, on which stress of brainwork is estimated, but included in Analysis.

To face p. 138.

has not been wasted. These, alas! are a minority. It is quite usual to find that the child can read, but without fluency, intonation, or understanding; can write, but so slowly and with such difficulty that he can attach no meaning to what he has written, and the accomplishment cannot be used in any of his other work; can work "the four rules" if—but only if—he is told which they are, and is unable to say how many counters are in one closed hand if four be taken from a group of nine which he has counted on the table. He can "add" in a manner which may be illustrated by a tragic experience recently reported in the *Journal of Education.* "A little girl of eight, fresh from the Kindergarten mistress, and 'knowing all the rules,' was set to add units, tens, and hundreds. The column looked unusually thin, and she set to work with a bright face. The sum of the units was seven. Five minutes later she was disconsolately gazing at her paper, and when she was asked what was the matter, the poor child replied in an aggrieved tone: 'I know you *ought* to carry.'" Here we have the result of formal teaching dissociated from facts of any kind, and quite unrelated to the child's own experiences. The occurrence is a usual one with quite intelligent children. The trouble is that they have never been made to realize number, but, instead, to learn rules; and this kind of thing is not only useless in itself, but an obstacle to later understanding.

We could quote instances of children who cannot read or write, or count, or realize any number above three, who can do bits of brushwork (quite devoid of artistic promise); bits of geography, which have no relation to anything they have seen or apprehended; bits of maps, which neither convey nor imply any knowledge of direction, distance, or level; bits of music, in which a bad hand position is all that is permanent; and perhaps half a dozen other things, quite unusable for later stages, and therefore without educative value. Scraps of Botany and Natural History are

common, the child having learned them all out of books, and not knowing the simplest flower or the habits of common animals.

All this kind of thing is a pernicious waste of time, and a travesty of modern educational methods which is likely to discredit them deeply. The arts of expression—good reading, writing, and speaking—are essential to the class whose education we are now considering, and these arts become easy only by use and habit. A child sees far more than it can say; it has more percepts than concepts; its first formal lessons, therefore, should be mere expression. Reading about anything which is thoroughly familiar or interesting *is* such a lesson in expression; reading about other things is not. Similarly with writing; let the child write the simplest possible sentences concerning things he knows well, and learn to express himself. Similarly, let him learn to describe what he sees and is interested in, without "doncherknow" and "whatsitsname," without long words or the misuse of short ones. These are early "lessons," not foolish scraps of Natural History, Botany, Geography, &c., &c., learned out of books. The place for the Brushwork is in recreation time and on wet days; the place for the Botany is the garden, where mother or sister shows the real flowers and what is to be seen in them, without "scientific" names at all; the place for the Natural History is in rambles with the father in the country or along the shore, or in such books as the child *willingly* may choose from the shelves. On ideas thus gained it is possible to build, because these are real sense percepts; the names of things gathered from books are not percepts at all, and are therefore incapable of conversion into concepts (ideas). Moreover, it is morally undesirable that a child should have baby notions of great historical epochs, and a memory stored with bits of geographical information. This pseudo-knowledge engenders a boundless conceit. How often does one hear a child who cannot read or write

decently, or observe that a group of five counters and one of eight counters makes thirteen without laboriously counting them, nor even describe quite simple things accurately, exclaim with swelling vanity that he knows "all about Nelson," or the names of the capitals of Europe.

The first year at school is then spent in sweeping his mind clear of the conceit engendered by the notion that he knows something of matters really quite beyond his powers of understanding (realization), and in giving him the baby-knowledge which he would have welcomed at the appropriate age, but now rebels at and despises, because he cannot see its necessity. If mothers would, during the eighth year, teach their children how to read with pleasure to themselves, to write little letters in which they understand what they are saying, and to recognise concrete numbers (of things), and count them by ones, twos, threes, fours, &c., up to tens, and *no other formal knowledge whatever*, reserving the brushwork, modelling, &c., for their proper place as play lessons; if, I say, they would do this, they would spare their children a vast amount of drudgery, and the punishment consequent on ill-will towards learning anything thoroughly, not to speak of lightening the task of the teacher, who needs all his energy and thought to avoid mistakes of his own, without using these up in correcting those of other people.

Had the intelligent child of eight who cannot read, write, or describe, to whom all expression is difficult only because it is unfamiliar, been accustomed for two hours a day for a year to do these things, leaving the other things to their time and place of recreation, the child's ambition to read stories to himself, to write his perceptions, to perceive number and grouping in the things about him, might easily have been awakened, and an incalculable amount of subsequent worry and fatigue to both teacher and pupil would have been spared. And, moreover, the one lesson of incalculable value would have been learned—that of endeavour

—and the resolution to tackle something that is *not* pleasant. Intelligent educative methods are being discredited by the attempt to turn all work into play, an attempt which happily is a foredoomed failure, because, could it succeed, it would involve the loss of the most valuable quality of the Anglo-Saxon race.

If children have been so prepared, there is no difficulty in carrying out the Syllabus. It does not of course lend itself to purely formal teaching, or to a paper co-ordination.

So long as boys prepare lessons "out of school," and three or four valuable hours each day are spent in "hearing them," the attempt to be thorough will imply increased preparation and more or less overstrain to the few who really try to learn, and the inattention of the many who do not, while defeating the main purpose; for a high standard will not be reached, but instead of it that most pernicious feature of school instruction—mere reliance on memory without understanding — and all that train of evils of which parents complain, *after* they have spent some £1,500 on a boy's education, and received for it that average knowledge of Greek, Latin, and elementary Mathematics which is very imperfectly cultural, and has no market value whatever.

3. A Modern Syllabus. The succeeding pages give for the years from eight to twelve the development of the Scheme of Instruction. The subject matter calls for no remark, being but slightly different from that in more or less general use, but the form differs from the usual syllabus in that it gives the leading concepts which each term's instruction is expected to convey, instead of the formal subject-matter of instruction in each term.

English Composition and Grammar, 240 Lessons.— The ruling idea is to teach good handwriting and spelling in the first place, and good English expression in the second. After Term IX. Composition and Analysis may be begun.

Young children who can write even fairly well cannot compose their ideas on paper. Perhaps the brain-centres cannot work together as yet; certain it is that the efforts to form the letters and spell the words makes simultaneous thought of the matter in hand impossible till about the eleventh year. Children's composition, to be of any permanent use, must be spoken.

Good expression is chiefly taught by insisting on grammatically complete answers in class, given in short, clear sentences. This habit will supplement most valuably the regular lessons in English Composition.

Term I. Time 20 Lessons.—Pictures or Objects connected with the History lessons are orally described by the class. From all the answers a correct description is gradually worked out in short simple sentences, and these are then dictated. These may sometimes be in the history note-books. Subjects from the Botany or Physics lessons may also be taken, but always a visible object, never a theme.

Term II. Time 20 Lessons.—As above; geographical scenes may be added, if desired. In all cases the children's own ideas are required. They are guided to see and to describe.

Term III. Time 20 Lessons.—Oral description as above continued. The History course will supply an inexhaustible fund of subject matter if good representations of arms, pottery, dress, architecture, statuary of the people, and epoch treated of, can be obtained. Historical scenes may be added with caution; as a rule they are too difficult for this age, when it is most important to discourage loose and inaccurate talk. The dictated sentences will now be written down, allowing some time in each lesson for their analysis into noun and verb, adjective and adverb.

Term IV. Time 20 Lessons.—Oral description may continue, but a certain amount of memory work may be introduced—description of places visited, or of a picture

shown for five minutes. Dictation as before, followed by simple accidence and statement of the parts of speech.

Term V. Time 20 Lessons.—Description and dictation as before, followed by analysis on Abbott's plan—(*How to Tell the Parts of Speech*, by the Rev. Edwin Abbott, M.A., Head-master of the City of London School. Seeley & Co.).

Term VI. Time 20 Lessons.—Reading aloud—paraphrase by the class on subjects chosen with reference to the History, Geography, &c., being then dealt with in other classes. Writing of these sentences in a natural order, and parsing of them.

Term VII. Time 20 Lessons.—As Term VI., but in place of parsing, analysis of a simple sentence into subject, verb, and object, and the subordinate clauses. It will now often relieve other classes to dictate the notes of the lessons there given.

Term VIII. Time 20 Lessons.—Written descriptions of places visited, scenes, historical events, pictorially represented. Analysis of the sentences. Syntax.

Term IX. Time 20 Lessons.—As last Term.

Term X. Time 20 Lessons.—A child of eleven should now be able to arrange his subject matter in order, and be able to write a simple essay. Such essays should, however, still be entirely descriptive, and not reflections on themes, and the thing, matter, or event described should be one with which he is familiar. He may now be introduced to the meaning of "Composition" as involving:—(*a*) clearness of idea, (*b*) grammatical sentences, (*c*) arrangement of the subject matter by heads, stages, or phases of narrative.

These essays may alternate with readings aloud, with good intonation of portions of such books as *Plutarch's Lives*, and the written paraphrase of these. The work of Term XI. and Term XII. will be conducted on the same lines, but accustoming the child to reproduce the sense of a chapter read to the class, and, in the next course, will be followed by essay writing and *précis* once a week.

History, 360 Lessons.—If the ultimate purpose of History is to give clear understanding of the real causes determining the conflicting or concurrent actions and mutual reactions of dominant races, historical material must, from the first, be presented in such a way as to reveal the essential likenesses and differences of the great race types.

The representative types of modern European History are the Celt, Roman, and Norseman, and each may be easily recognised by the child, by physical appearance, works, tastes, and ideas of Right; but only if the lessons given are essential parts of a definite course, adapted alike to the exigencies of the subject and to the imperative claims of each successive development of the child's mind.

Nothing is educationally and practically more worthless than the hotch-potch of disconnected so-called "historical" information with which the average schoolboy is equipped; and nothing has a more liberal cultural value than the steady development of those broad principles of human affection, thought, and action, which underlie the real drama of History. Here, perhaps, more than in any subject with which we are educationally concerned, success depends—1st, on a right selection of the raw material of History; 2nd, on its presentment at the right time, and in the true order of development of the individual and the race. The practical difficulties are many, but the following Syllabus contains suggestions for a four-years' course, which has been worked out in view of definite guiding principles. Wherever possible, the available original material is indicated.

Term I. Time 30 Lessons.—The Celt, his physical appearance from early hero-tales. Descriptive passages from the Tain-Bo-Cualgne:—Cuchulain, Ferdiadh, Medbh Emer; reproductions of the Gallic Warrior from the column of Antoninus, and the "Dying Gladiator." Celtic works, arms, forts, houses, dress, pottery, ornament, should be

copiously illustrated (*vide* Wood Martin's *Pagan Ireland*). Such MSS. as the Courtship of Créde and Cael from the Book of Lismore, and the Mesca uladh from the Leabhar na H-Uidhre, give copious, graphic, and highly detailed descriptions of the interior arrangement of early Celtic homes. For translations, *see* Professor O'Curry's *Manners and Customs of the Ancient Irish.* 3 vols. David Nutt.

For the Celtic Priest as teacher, law-giver, and healer, use Cæsar's Narrative, and Strabo.

The power and functions of the Bards should be shown by selections from Aneurin, Taliessin, Cadoc (*vide Revue Celtique*, January and November, 1878, and Lady Charlotte Guest's *Mabinogion*, pp. 471-504).

Analysis of the material given should bring out a relatively high civilization, and the humanizing influence of primitive mysticism. It should leave the child with definite ideas of the functions and influence of the Warrior and Priest, and the social habits, industries, and family life of a pastoral people.

Term II. Time 30 Lessons.—The Roman Conquest of Celtic countries, from the narrative of Cæsar and Tacitus, Roman works and military organization modifying Celtic civilization, may be illustrated by the Roman towns of Julius Agricola, and his system of local municipal government. Roman mythology, implying intellectual rather than moral culture, should be shown in its relations with the primitive religion of the Celts, and by the persecution of the British Christians under Diocletian. The term's work should end with a clear review of the actual progress made during the Roman occupation of Britain, and an intelligent appreciation of the real elements of a higher civilization, viz., Christianity and Roman agricultural and engineering skill.

Term III. Time 30 Lessons.—The Norsemen. The Barbarian Invasions show the long results of steady progress in civilization and morals under Celtic and Roman in-

fluences, swept away before a people dominated by a rude, but strong, nature worship, implying neither moral nor intellectual restraint.

The Norse type is best illustrated by the early English of the Peninsula. Perfectly definite ideas of the blood-bond, homestead, moot-hill, 'Eorl' and free-man, as the basis of English society, must be given. Stories from the Icelandic Sagas and Eddic poems may be freely used to illustrate Norse types and customs. Copious material for this period may be taken from the *Corpus Poeticum Boreale*, edited by Vigfusson and Powell (Clarendon Press, Oxford, 1883), Dasent's translation of the *Njals Saga* (Edmonston & Douglas, Edinburgh, 1861), and Anderson's *Younger Edda* (Scott, Foresman & Co., Chicago, 1897). Children may become familiar with objects of Norse art and industry by means of the many fine illustrations in Du Chaillu's *Viking Age* (John Murray, London, 1889). Bracteates, fibulæ, pins, bracelets, rings, instruments of weaving and embroidery, of the plough, war, athletics and games; buildings—long-ship and skäli,—carved portals and high seats, tell their own tale of the familiar life and occupations of our forefathers.

Term IV. Time 30 Lessons.—The English Conquest. The progress of the Teuton in the great river-valleys should be given in detail. The term's work should result in perfectly definite ideas of *how* war begot the king and increased slavery, and of how the extermination of the Celt in Britain made England the "one purely German nation which rises on the wreck of Rome."* The history of Saxon progress in the valleys of the Severn and Thames; the English annals of Deira and Bernicia; and the annihilation of British forces at Dægsastan—are the best historical material for this period. Wherever it is possible, historical record should be supplemented by original song and legend.

*Green's *Short History*, p. 24.

Poetry and romance engender sympathy, and sympathy is the first great essential for real understanding of the individual or the type.

For example, such of the Mabinogion as are not loaded with allusions to Norman customs, art, and luxuries, or defaced by the fantastic perversions of later continental romance, may be used to fire the imagination, sharpen the edge of memory, and relieve the dreary record of the Saxon settlement. The "monotonous plaint" of Gildas may be monotonous to the historian in search of accurate, detailed information on the actual progress of the Saxon forces, or the marshalling of the British elders, but his free expressions of hatred and contempt for the heathen "wolves, dogs, whelps from the kennel of barbarism," fascinate the uncritical imagination of the child.

Term V. Time 30 Lessons.—The Western and Roman Missionaries among the English. A series of striking biographies—Patrick, Columba, Augustin, Paulinus, Aidan, Cuthbert of Melrose, Æthelberht, Edwine, Oswald, Rædwald, and Penda—should show the gradual yielding of the Norsemen to spiritual influences in their contact with the conquered race. The five kings above chosen show characteristic varieties of the Norse type under new influences.

Term VI. Time 30 Lessons.—English Christianity. The story of the secession of the Irish monks, the work of Theodore of Tarsus in England, extracts from Cædmon, the founding of English abbeys such as Crowland, Peterborough, St. Hilda's, the attitude of Wulfhere of Mercia and Egfrith of Northumbria towards the Church, and the clearing of forest and marsh lands by the monks, should again develop the idea of Christianity as a main factor and pioneer of civilization.

Term VII. Time 30 Lessons.—English law and learning may be best illustrated by the codes of Ine and Offa, and the work of Bæda and Alcwine. Charlemagne's protection of English merchants and pilgrims to Rome should be so

presented as to make it apparent that England lay outside the European order founded by Charlemagne, and more or less independent of it—a development of the subject which should enforce the leading idea of the Fourth term.

Term VIII. Time 30 Lessons.—Ælfred and the new ideal of national independence and culture. The royal administration of Ælfred, and the ecclesiastical administrations of Dunstan, both admirable for their time and circumstances, must be clearly developed. The biographies of Ælfred and Dunstan, and the history of the Danish Conquest, with copious illustrations of the weapons, dress, art, and ornament of Saxon and Dane, is the best material for this purpose. Specimens of Ælfred's translations, and copious extracts from the *Saxon Chronicle*, may be given to illustrate the kind of work done in monasteries and schools.

Term IX. Time 30 Lessons.—The English Restoration and the Norman Settlement. The history of the Restoration, with Godwine, the Confessor, Harold, and Stigand as central figures; and the story of the Norse settlement in the Cotentin and Bessin districts, with William, Herlouin, Lanfranc, and Anselm as central figures, coming immediately after the history of the Danish Conquest, should bring out clearly those permanent race characteristics of Celt, Latin, and Norseman persisting under changing conditions, which make the Norman, and indeed all subsequent European civilizations, what they are.

Such a course as above indicated would have the following definite results:—

1st. At 11 years of age the child would be intimately acquainted with the most striking biographies of English History up to the time of the Norman Conquest.

2nd. He would be familiar with the works, art, and temper of the three dominant types in European history.

3rd. He would have a formed principle of intelligent selection to guide him through the devious mazes of

advanced religious, political, and military history. Finally, his interest and sympathy would be keenly alive, and the subsequent epochs of his country's history — Norman England, the Hundred Years' War, the New Monarchy, the New Learning, the Reformation, Elizabethan enterprise, Puritan England opposing the Divine Right of Kings, and the real elements of Victorian progress — would be easily mastered by him, because easily recognised as the natural results of natural causes.

French, 780 Lessons.—The planning of a successful modern language course is far more a matter of common sense than of critical selection. It must be borne in mind that the great essential is a teacher who is really conversant with the language he professes to teach. Translation must be utterly abjured, and nature's method, involving the sense-perception of the thing first, and then the word for it, as far as possible adhered to. There are all the elements of failure in the method which says "le chien" is the French for "dog"; and all the elements of success in that which, pointing to a dog, says "Qu'est ce que c'est? C'est un chien." The class looks, the word is repeated by each child; the question again asked, this time to be answered by the class, and the answer written on the blackboard by the master. Henceforth the written or spoken word "chien" calls up a mental image, not of a French word of five letters, but of the living animal; already, as far as he has gone, the child thinks in another tongue. Detailed conversation lessons have been so admirably worked out by Messrs. Swan and Bétis,* by the Professors of the Berlitz School, and by the Editors of Conversations on the Pictures of Edward Hoelzel (Lucien Genin and J. Schamanek, L. Durand and M. Delangue), that it is superfluous to offer any further suggestions on the way the lessons should be

* *Psychological Methods of Teaching and Studying Languages*, by Messrs. Swan and Bétis (G. Philip & Son).

conducted. The following syllabus is therefore arranged with the intention of showing the actual ground—conversational, grammatical, and literary—which should be covered by a four years' course.

Term I. Time 90 Lessons.—Pronunciation exercises, the alphabet and vowel sounds, leading up to names of objects, and simple statements about them, made in the present, past, and future tenses. All new words to be clearly written on the blackboard by the teacher, and used as a reading lesson by the class.

Term II. Time 90 Lessons.—Oral exercises on pronunciation of short sentences. Simple question and answer conversations about every-day subjects. Easy sentence reading from the blackboard should be followed by the dictation of the *same* sentences with slight variations on them. Short poems to be learned by heart, and written out from memory.

Term III. Time 90 Lessons.—Moods and tenses of verbs must now be explained, and the auxiliary verbs, with the four conjugations, read and written out by the class. Only the simple tenses should be given, and each tense used by teacher and class in rapid and varied succession. Dictation must introduce the different parts of the verb learned in all its forms. Easy History reading on the Frankish, Burgundian, and Visigoth settlements in Gaul, to correlate with the English work, may now be begun.

Term IV. Time 90 Lessons.—Simple objects and scenes may now be orally described by the class, with the help of occasional questions. Simple idioms may be given, and recent events or experiences described by the children, who should use the given idioms in several different connections. Easy dialogues may be learned and acted. History reading twice a week on the Conquests of Clovis.

Term V. Time 90 Lessons.—The principal irregular verbs and their idioms, with oral and written conversational exercises on them. Daily reading lessons must be con-

tinued till the children read History fluently—as before, on the Franks and Christian Missionaries. Easy French comedies should now be learned and acted, the children writing out their own parts.

Term VI. Time 90 Lessons.—Explanation of the construction of sentences may now be given, followed by easy compositions on visible objects. Daily conversation and reading as before, introducing idioms of increased difficulty. History reading should be descriptive of the Gallo-Roman Church under the Frankish kings.

Term VII. Time 90 Lessons.—Composition on simple objects, from memory, may now be added. Conversation and reading as before. Oral and written question and answer exercises on History work may now be commenced. Charlemagne's Wars, told as dramatically and simply as possible, should be the term's History reading.

Term VIII. Time 90 Lessons.—Composition, conversation and reading as before, but steadily increasing in difficulty. Selections from an old French Classic, *e.g.*, the Chanson de Roland, may be read and learned. Dictation of simple grammatical rules, and copious applications of them may be begun. General conversations on the History lessons should now deal with Charlemagne's administration, educational reform, and the founding of a European order.

Term IX. Time 60 Lessons.—Rapid, general conversation on History work, and a written *résumé* of each History lesson, should now be easily made by the children. Short, suitable newspaper accounts of current events, which may reasonably be supposed to be interesting to children, should be read by the class one day, and told in their own words the next. Regular Grammar instruction may now commence—*i.e.*, rules must be explained by the master, read, and applied in all their bearings, but not learned, by the class—though the *sense* of the rule should be easily and briefly given by any child on application. The reading lessons should now be from modern French romances, *e.g.*,

La Belle Nivernaise, *Le Petit Chose*, *L'Abbé Constantin*, etc. History reading should be on Feudal France; *résumés* to be made in History note-books, henceforth to be regularly kept.

Terms X. XI. and XII.—French History reading as far as possible from original authors; two lessons a week in composition; familiar, daily conversation. Scenes from French Classics, Molière, Corneille, Racine, may now be read, learned, and *acted* whenever possible; for the then ensuing terms, regular French History, to interlock with English History, may be read aloud and analyzed.

Latin, 270 Lessons.—There is some difficulty about the statement of purpose here. Three distinct arguments are usually advanced against those who impugn the value of a Classical education :—

(*a.*) That Latin is, or might be again, as it was up to the XVth. century or later, a common speech between educated men, and that, in any case, it furnishes common data of thought and expression.

(*b.*) That the cultural effect of the incomparable beauty of the great masterpieces of literature is unapproachable by any other method, and is essential to scholarship.

(*c.*) That the construction of the Latin sentence affords a mental gymnastic and practice in verbal accuracy which no other linguistic work can rival.

It is clear that the curriculum framed to give effect to one or other of these leading ideas must be widely different. The partial truth of the first contention depends of course on the fact that Latin instruction *is* widely prevalent, and therefore its basal ideas must be common to all who have passed through the mill; while, unfortunately, oral fluency is not cultivated.

As to the second, the Hon. T. Lyttelton, Head-master of Haileybury, writes (*Teaching and Organization*, p. 211):—

"When closely questioned, no advocate of the Classics ever professes that this (ripe scholarship) is really the object in view for the mass of boys. Many a score of our pupils leave off too young to get even a glimpse of the beauties of any authors they read; many a score besides go on long enough to find that the taste for such reading has been denied them. And yet we cling to Latin for all, and Greek for some, while the evidences of failure in this particular attempt are growing more frequent and convincing than ever." It is therefore admitted that nine-tenths of the boys who go through the training can never be scholars, and the third line of defence is selected:—that "the learning of these ancient languages in its earlier stages affords an opportunity for precision of thought, memory, inference, and accuracy; in its later stages it is capable of enriching the mind with noble ideas. The aim of the school is therefore to instruct till the ages of sixteen or seventeen in such a way as to secure the earlier benefits, if boys leave then, while gradually paving the way for the later benefits in case the study continues to the University."

It would be folly here to attempt to modify the purpose thus defined, supported as it is by the whole University and much of the Examination system, and being, as it is, the only systematized portion of the usual Humanist curriculum;*

* How completely this is the fact may be illustrated from the work of my own boy, in ascending by regular term removes from the 1st Form to the Army class of one of our great public schools. While the sequence of his Classical work was uninterrupted, that of his English History may be given as a sample of the rest of his form work—

1st Form. Norman Conquest, from Edith Thomson's *England*.
Lower II. Edward I., II., III.
Middle II. Mary and Elizabeth.
Lower III. A.D. 1603-1628 (from Creighton's *Epochs*.)
Upper III. A.D. 1530-1559 (from Creighton's *Epochs*.)
Upper III. William and Mary, from Gardiner's *History*.

All intermediate periods are of course omitted, with the result that the boy's knowledge of English History is too fragmentary to be of the smallest value for any purpose soever.

and we therefore adopt it, merely modifying the usual method of teaching by associating, as far as possible, the word and the thing, as in the Modern Language course in the earlier stages, and going on through the usual stages of *Gradatim*, *Tripertita*, *Principia*, Mansfield's *Latin Exercises*, or similar books, and *Cæsar's Gallic War*, merely endeavouring to read the latter thoroughly and intelligently with maps and plans, as well as with the grammar and dictionary.

At the same time, could it be made to fit the examinations, we admit our strong preference for a Latin course, which should begin precisely as a Modern Language course begins—orally, and should go on to a literary treatment of the language, giving more and more place to grammatical analysis and composition. There seems no valid reason why this course should not go on, as indicated in Table I., to such a command of the language as should bring a much larger percentage of boys within view of the beauties of Classical literature, and perhaps lead to a somewhat larger number obtaining the distinct cultural and humanist value which was not found impossible three generations ago; trusting to a realist instruction in Science, rather than to the structure of the Latin sentences, for the training in precision of thought, inference, and accuracy. As for memory, that which excites interest will probably be remembered, whatever its nature.

And we further dare to avow a still stronger preference for making the refining ideas of Humane letters accessible to the average boy by means of his own mother tongue, rather than by a medium which, as a general rule, serves to shut them off from him rather than to make them accessible.

Arithmetic, 600 Lessons.— Children's difficulties in Arithmetic arise largely from a confusion between the actual physical operation of adding, subtracting, etc., with

the written signs of these operations. The purpose of the earlier stages of instruction should therefore be to accustom them to regard all questions dealing with number as concrete matter for reasoning, to be afterwards noted down according to a regular convention.

If a child has been taught well up to eight years old* he should then be able to realize the actual operations of simple addition, subtraction, multiplication, and division, but *this is very rarely the case.* It is therefore most necessary to go over this ground, which is the fundamental arithmetical concept.

Term I. Time 60 Lessons.—There will be only three leading ideas to be given this term :—(1) that addition is the putting together of groups of similar things ; (2) that there is a regular settled way of using signs, or figures, to write this down ; and (3) that this numeration can be applied to keep before us bigger numbers than we can easily remember. These ideas are given by actual putting together groups of counters, peas, marbles, etc. ; by practice in mental (spoken) addition ; and by adding aloud of regular increments, *e.g.*, by four, beginning with 2, 3, 4, 5, etc., etc., and by Miss Wulfson's admirable system of Cards.† When this concept is quite clear, and addition fairly fluent, which will take more time than would be imagined, the signs for these operations can be presented, and numeration, dealing with the intrinsic meaning of figures and their place value, can be taken up. Lastly, the child, who has now the definite ideas of concrete numerical operations and their written symbols, can apply this knowledge to the addition, first of measured lengths

* Up to this age all the Arithmetic a child needs is to be able to count by increments of 2, 3, 4, etc., up to 10, to visualize numbers as sets of ten and remainders, and the repetition and subdivision of such groups. No formal Arithmetic should be permitted, and this, with fluent reading and fair writing, gives all the formal groundwork required.

† *Visual Arithmetic for Juniors*, T. Wulfson. (G. Philip & Son).

and other concrete quantities, and then to written problems of the usual kind, for which Blackie's *The Century Arithmetics* (G. Philip & Son), or any of the Board School Standard Books, will give many excellent examples well suited to the age.

Term II. Time 60 Lessons.—Subtraction similarly dealt with, beginning not with figures and a "rule," but with concrete objects, till it is realized that subtraction is the taking of a small group out of a larger one. Its symbolic representation to follow.

Term III. Time 60 Lessons.—Multiplication. If the work of Term I. has been well done, and the child can add rapidly by all numbers up to 12, the Multiplication Table will give no trouble, for each column in it is a series of two 2's, three 2's, four 2's, etc.; two 3's, three 3's, four 3's, etc.* It is soon remembered, and steps lost are found in practice to be easily recoverable. The idea of multiplication as the repetition of a group so many times is thus fixed.

The numeration and its common sense follows, and then the practice, as before, first by tangible examples (*e.g.*, one brick in a wall is found to be 9 inches long; find the length of 43 of these), and then by theoretical or imagined examples. Division can be dealt with in this term on the same lines, as the splitting of a large group into equal smaller ones. If the Addition and Subtraction have been realized, the Multiplication and Division will give little trouble.

Term IV. Time 60 Lessons.—Arithmetic of money. Provide actual coins, and make the children realize their conversion. Fluent recognition and statement of values should precede any problems. Hard as it is for the average adult to realize, the little ones are puzzled by having to recognise a coin, remember its value, and perform the

* On no account $2 \times 2 = 4$, $2 \times 3 = 6$, $2 \times 4 = 8$, etc., which quite stultifies the meaning, and makes the table a matter of mere memory.

required operation at the same time. Provide dummy coins, and let the class do simple problems with actual pieces. Then the symbolism as before.

Term V. Time 60 Lessons.—The arithmetic of area and solidity may now be dealt with in the same way. Actual lengths are measured, and the children construct their own tables of inches, feet, yards, centimetres and metres, and use them, not learn them—they stick of themselves. Area and solidity follow naturally—the inch or centimetre as the unit of length leads to the square inch or square centimetre as the unit of surface, and the cubic inch or cubic centimetre as the unit of solidity. These ideas, like all primary ones, are however slowly formed, and will take a full term: it is quite futile to expect them to be remembered from one or two lessons, as will be revealed by the examination of almost any class of boys of nine or ten, who have "done their tables" out of a book in the usual way.

Term VI. Time 60 Lessons.—The arithmetic of capacity follows naturally from that of solidity. Here it will be advisable to use the Metric System almost entirely, merely pointing out that $34\frac{2}{3}$ cubic inches are called a pint, $69\frac{1}{3}$ cubic inches are called a quart, and the decimal notation being a pure convention just like place value in numeration, is conveniently introduced here.

Term VII. Time 60 Lessons.—The child going through this course at normal age is now about ten years old, and should be able to combine some concrete numerical ideas into abstract numerical ideas, and may begin decimal notation and treatment. He has to realize that the use of the point is to mark the place whence reckoning to the left place values increase by multiples of 10, and whence reckoning to the right they decrease by multiples of 10, and thence to deduce the common-sense of the four rules as applied to their values.

Term VIII. Time 60 Lessons.—Division of decimals and general exercise in decimal quantities.

Term IX. Time 60 Lessons.—From this point the usual arithmetic course may be followed—dealing with factors of abstract numbers. H.C.F. and L.C.M. are most conveniently realized by concrete examples—the length of a wall-paper pattern to fit a room of given length, of panes in a window or greenhouse, of tiles in a pattern, etc.

Term X. Time 60 Lessons.—Fractions treated first as a visible "part broken off" from one unit or group, and passing to its abstract or denominational value, and the consequent operations and methods.

Terms XI. and XII. Time 60 Lessons each,—will deal with fractions in the usual way. This course has been framed for the average boy, and if given them by concrete examples, will be found to be fairly well assimilated by about half the class. The other half will probably be composed about equally of those who find the reasoning very easy, and should be set to more numerous and difficult applications of it; and of those whose natural inaptitude causes them to fail in passing from the concrete to the abstract. This submerged fourth will at all events have acquired the simple ideas, will know thoroughly as much as they know at all, and will have gained more than if the presentment had been abstract from the first.

The writer's experience is that the decimals are not found difficult.

Geometry, 240 Lessons.—The intention is to familiarize with the actual forms treated of, *not* to generalize more than absolutely necessary in examining each typical form.

The common error in geometrical teaching is to confound the concept itself with its expression in words. Definitions are conscious knowledge, but the concept precedes the definition. Usually the definition is made to precede the concept, with the result that hundreds and thousands of boys stultify the whole meaning of geometry as reasoning, by learning their Euclid by heart!

Term I. 20 Lessons.—The concepts to be formed are those of straight, regularly curved, and irregular length, by actual drawing of these; of the square as a surface of certain describable shape; of the 45° triangle formed by cutting a square in half along a diagonal; of another form of triangle by cutting two juxtaposed squares along a diagonal; of the meaning of a flat angle as formed by two meeting edges, and a solid angle as formed by two meeting surfaces; of the drawn representation of all these where lines are put for edges.

Term II. 20 Lessons.—Deals with the circle as a flat surface (not a ring*), and how to draw it; deducing its rule or law, and the concepts resulting from these; that the angles at the centre make, are, or make up, four square angles; that the radius will go six times round the circle as chord; that a hexagon can be made of this; that this hexagon can be divided with six peculiar triangles; that these can be made in another way.

Term III. 20 Lessons.—Applies the principle of the circle, that every point on the edge is at the same distance from the centre, to the equal division of lines and angles—done, of course, as practical drawing, not as formal reasoning; and hence learning to construct triangles, and forms which can be made up of triangles, from lines of given length.

Term IV. 20 Lessons.—The experimental discovery that the angle in a semicircle is a right angle, is applied to draw perpendiculars, and to construct various right-angled triangles.

Term V. 20 Lessons.—Notion of parallel lines by comparison of the rectangle and hexagon, and use of the circle to draw parallel lines: these are (as before) done as exercises in drawing, emphatically *not* as rough sketches as exercises in reasoning. The discovery that if a straight line be

* I find that a considerable number of boys invariably regard a circle as a ring, although they can repeat Euclid's definitions glibly enough.

drawn across two parallels, the alternate angles are equal, is applied in various ways, and to the construction of scales.*

Term VI. 20 Lessons.—Applies the foregoing to the construction of plain scales; no general reasoning.

Term VII. 20 Lessons.—Tangents. The concept to be formed is that of a touching line, and its relation to other parts of the circle. Experimental discovery that if a straight line touch a circle, and a perpendicular be drawn from the point of contact, the centre of the circle will be in that line, and conversely (*Euclid*, iii. 19). Application of this: conscious reasoning now takes an increasing place in the course, but never displacing correct drawing.

Term VIII. 20 Lessons.—Applications of the above: one circle in polygon, six in hexagon, etc., using Carroll or any other good geometrical course.

Term IX. 20 Lessons.—Circles touching other circles; *vide* Carroll, lessons 15 and 16, and their applications.

Term X. 20 Lessons.—Geometrical construction and computation of equal areas: concept gained, that one area can be equal to another of different shape. Carroll, lesson 19 and preceding.

Term XI. 20 Lessons.—Concept to be gained, the idea of proportion as exemplified by lines of given multiples of a unit length; connection of such lines with fractional values, and how to write this.

Term XII. 20 Lessons.—Formal Geometry. *Euclid*, Book I., which will be found very easy by quite average boys, who would now as soon think of learning it by heart as of learning the analysis of bowling of the season's matches.

Geography, 360 Lessons. — This course has three objects:—(1) to ensure that each and every geographical

* *Practical Plane and Solid Geometry*, by John Carroll, Art Master, Hammersmith Training College (Burns and Oates, 1s. 6d.), is as good a book as can be used for this and the following portions of the course.

word shall have an exact meaning in the child's mind in terms of size, direction, distance, and level; (2) to enable him to read a map and form a sound idea of the physical anatomy of the country portrayed; (3) to give him definite ideas of the leading characteristics of his own and other lands.

It is not intended to make him a walking Gazetteer, able to locate all the chief towns of the four continents, to give the population of the British county and manufacturing towns, the lengths of the rivers of Europe, the longitude of Patna, and the height of Mont Blanc, though this is actually the kind of information examiners usually expect.

No man endeavours to carry such information in his head (unless to pass an examination at which it may be called for); he knows where to go for it at any time; nor should a boy or girl be asked to do so. Primary ideas and their applications are needed, not the information of the gazetteers; and how greatly needed may be illustrated by any of the numberless false conceptions afloat—for instance, by the fact that most persons think of a river as coming from a "source" or "spring," instead of as the aggregate drainage of a large basin, mostly flowing under the surface to the lowest line between two watersheds, and hence entirely ignoring how this ground-water may be polluted. Principles, and not encyclopædic information, make the value of geographical as of all other knowledge.

Term I. 30 Lessons.—The ideas to be gained are clear perceptions of direction, distance, and level. The child learns to draw the top of a table, the class-room, and the garden plot to a reduced "scale"; to lay down the north and south line by the shadow of a vertical pole, or string, at noon; to find the north direction by the compass; to realize that all north and south lines in the field are parallel; that the North, South, East, and West are general directions; that all heights are measured from the same "level"; that hills are measured from "sea-level."

Term II. 30 Lessons.—Brings out that the slope of a hill depends on its base and height; and the meaning of ranges, valleys, and watersheds. Cutting out and modelling various slopes, bases, and heights gives this concept, which is then applied, together with last term's idea of "scale," to modelling the neighbouring country. I have a model of Guernsey, done in sections by children of this age, which has served to bring home by application all these ideas of scale, direction, distance, and level, as well as to habituate them to the miniature representation of bays, capes, hills and plains, bearings, watersheds, valleys, and rivers, as well as to observe the actual forms of the land and sea in their walks and excursions.

Term III. 30 Lessons.—The same ideas are now extended to the British Isles. They learn to read a physical map, to work out the form of the ground from it, and then to model the land in clay, with its chief watersheds and rivers. From this, in *Term IV. (30 Lessons)*, they work out the chief river-basins of the two islands, and make a map of these; and to enable them to transfer the miniature to the actual, are shown, by the lantern views of the scenery of these localities, forms of mountain and coast, and other characteristic views.

Supplementary geographical work deals with the Physical Geography of Scandinavia; map reading and scenery only, as may be required by the History course.

Terms V. and VI. 30 Lessons each,—complete the Physical Geography of the British Isles, the class first reading off the map all they can unaided, then having their deficiencies supplemented by their teacher, who proceeds to set them to make their own maps, embodying just what they have learned. These maps are kept as a permanent record of work, and for their own use. The supplementary work deals with the Physical Geography of Central Europe in connection with the History course.

With *Term VII. (30 Lessons)* begins Political Geography,

exemplified by the Geography of Modern Britain, and the county as the administrative unit. The Counties of England and the arterial railway routes introduce the class to the uses to which the land is put. They make their county map, observing the natural boundaries and grouping of counties, and lay down their railway lines. The method of instruction at this stage is for the class to say how a given county is approached from London, what they remember of its physical features, afterwards reading these from the wall map in greater detail. They are then told how these natural physical features influenced development of the county, given some of its history, and *shown* by the lantern some two or three distinctive features to be associated with the name, *e.g.*, Aberdeen—the granite city; Perthshire — the Trossachs; Oxfordshire — the colleges; Wiltshire—Stonehenge, etc.

Terms VIII. and IX., 30 Lessons each, complete this instruction for the British Isles.

Term X., 30 Lessons, introduces the class to British industries; shows them by examples how towns grow and become important: as London by government, Oxford by learning, Sheffield by manufactures, and Liverpool by distribution; and takes them to the great manufacturing centres, and brings before them, by the lantern slide, the processes of spinning in Yorkshire, weaving in Lancashire, coal mining in South Wales, Scotland, and Yorkshire, iron smelting in the Midlands, &c., machinery at Birmingham, &c.

The supplementary work has meanwhile dealt with the several countries of Europe, interpreted by the ideas gained about the British Isles.

Term XI., 30 Lessons, carries on the same sequence of instruction, dealing mainly with ship-building on the Clyde, the Tyne, the Mersey, and the Thames, with the evolution of the British Navy, and with its arsenals and dockyards.

Then, when distinct ideas of the surface and extent of a country, and of the meaning of its internal civilization, have

been gained, and some notions of the extent of the continent of Europe and its physical features ; when geometrical and numerical reasoning has habituated the child to deal with large unseen magnitudes imaginatively—he is fit for world geography.

Term XII., 30 Lessons, completes the primary geography course, with the sphericity of the Earth and its diurnal rotation producing the day, its movements in orbit the year ; the seasons, latitude and longitude, and the causes of varying climates.

The child can now read a map intelligently, and is able to transfer his ideas by its aid to any portion of the Earth's surface. He can read Humboldt or any book of travels with understanding and interest, and can now, if required, begin in his second course the study of Formal geography, which takes for granted all the primary ideas.

Botany, 120 Lessons.—The purposes in view are : Firstly, to give an intelligent interest in the plants which a child sees about him. It is not intended to end in a knowledge of formal botany, for which a totally different course would be framed.* Secondly, to associate very early the ideas of reproduction with clean and open instead of unclean and surreptitious images.† Thirdly, the knowledge of form and functions prepares for later physiology. The first year's instruction of 10 lessons in each term, mostly out of doors, will deal with the seed and the parts of the plant—its root, stem, leaves, and flowers, with their chief visible varieties; this being assisted by notes, sketches, and pressed speci-

* Of such a formal course the remark of Dr. Hooker in his well-known primer on Botany is perfectly true. "It is a mistake to suppose that learning botany has any great attraction for the young. . . . the utmost the teacher can expect is, to find the lessons in botany less forbidding than most others."

† Clean-hearted children will here find the satisfaction of the legitimate curiosity of intellect. For the curiosity of sensation, which is the bane of so many, there is, alas ! no such easy mode of treatment. Still the former has its effect and advantages.

mens. In the next year the form and structure of typical flowers will lead to the analysis of structure. The marvels revealed by the microscope then becomes the step to the discovery of the cell as the primary unit; and in the third year, at about ten years old, the child learns the process of fertilization of the flower, the growth of the ovary, and the ripening of seeds and fruits. At the end of such a course he will be unable to classify plants, and will be a stranger to the Latin names of genera and species, but he will know all the differences in forms of leaf and flower on which this classification is based, and should have some insight into those marvels of Nature which appear as soon as the attentive eye looks beneath the surface.

Physics, 360 Lessons.—The intention of the elementary course is to accustom the child to observe accurately the likenesses and differences of things around him, and gradually to lead him, by many common examples, to that formed concept of Force as a universal proximate cause of all occurrences; which will fit him to assimilate later quantitative knowledge, which constitutes "Science."

Term I. 30 Lessons.—The child learns the visible differences between objects presented to it; to name correctly their colours, shapes, and sizes; to distinguish them as transparent, translucent or opaque; bright or dull; solid, liquid, or air-like; to observe their textures (as crystalline, fibrous, spongy, porous, &c.). The tangible differences there are brought to his notice by smooth and rough things; hard and soft; stiff or pliable; elastic or inelastic; strong or weak; hot or cold—and so forth. Colour, its tints and shades, engages his attention; and he ends with measurements of length and weight. Children of this age can measure to 1 millimetre and weigh to 10 milligrams.

In Term II. (*30 Lessons*) he applies the latter concept to measurement of lines or lengths, and then makes the distinction between units of length, units of surface, and

units of mass. These concepts, together with the discovery that the volume of a shell or measure is that of the solid which just fills it, and that the cubic inch or cubic centimetre may have any shape, will fill this term amply and profitably, and more must not be expected. Many boys of fifteen "know" these easy things, few *realize* them.

Term III. 30 Lessons.—The knowledge of properties, and the ability to weigh and measure, will now be applied by exercises in gauging and measuring, and by lessons on the common earths, stones, ores, and metals.

Term IV. (*30 Lessons*) deals with water—that it dissolves many things, but unequally; the difference between solution and mixture; how to filter; that water when heated becomes steam; which can be turned into water again; that rain is condensed cloud; that water can be measured both by bulk and weight, and how to do this accurately; and finally, that as water is heavy, it presses on the bottom of a tank, and that pressure in water is passed on in all directions.

Term V. 30 Lessons.—The lessons on water prepare for a similar set on air as the typical gas, by which the concept of a gas is formed. That air is a stuff, and has weight; that it presses all ways; and is elastic; and the distinction that, whereas solids keep shape, size, and weight; liquids keep size and weight; and gases keep weight only—will complete this term's work.

Term VI. 30 Lessons.—The notion of Force is now introduced, gravity being taken as the type. The discovery that each mass travels *straight* down is experimentally made and proved, followed by that of the "centre of gravity," and its position in typical planes and solids.

Term VII. (*30 Lessons*) applies this knowledge to easy problems in stability, and lead up to the idea of pressure per unit of area. Throughout these measurements, the inch, pound, and second are used occasionally, the centimetre, gram, and second habitually.

Term VIII. (*30 Lessons*) deals with some properties of liquids, for which the learner is now prepared. He can understand easily that the pressure on a unit of area immersed to any given depth, is visibly the same both upwards and downwards, inasmuch as it does not move. He can reason why this must be so, and hence, in

Term IX. 30 Lessons.—Deduce and represent all the elementary phenomena of flotation; all being discovered by the learner experimentally, and then accounted for by known principles.

Term X. 30 Lessons.—The balance of pressures, whereby things float or sink, leads naturally to the consideration of the weights of various kinds of stuffs, and their experimental discovery.

Term XI. 30 Lessons.—We now return with enlarged ideas to the weight and pressure of air, the construction and use of the air-pump, the working of a water-pump and of a siphon, ending in:—

Term XII. 30 Lessons.—The construction of the barometer and pressure gauge, and deductions from these.

The whole of this course is given heuristically, the child discovering for himself at each step, and being only guided by his teacher; accounting for each discovery as soon as made, and applying it in subsequent work. We can assure those who may think these matters too difficult and recondite for children, that, so long as presented in common English, they are understood and welcomed. The facts themselves are found interesting and fairly easy; it is the "specific gravities," the "hydrostatic balance," the definition of "density," and other nomenclature of formal science, which drives out the idea in the effort to remember the names. Nor is more required at this age, which is that in which concepts, not definitions, are required; given the former, the latter will follow in due time.

Drawing, 480 Lessons.—The ruling idea requires to be more clearly kept in view in this course than in any other, for very opposite ideas are prevalent. The following elementary course is based upon the view of Drawing—that its object is to develop manual skill and perception of proportion for the many, and to give artistic opportunity for those who have the gift.*

There are provided:—pencil, ruler, coloured chalks, powder, tortillons and cartridge paper, ruled in faint squares $\frac{1}{2}''$ size, brushes, water-colours, and palettes.

Term I. 40 Lessons or more.—The children learn to draw straight lines *exactly* from point to point, at set distances apart, first with the ruler and then freehand, with free, easy shoulder motion. They may then start in pattern drawing, using the squared paper.† These will be coloured by the children, using tortillons and chalk powder. The method used is, that the teacher draws an example on a sheet pinned to the blackboard, and shows the touch required. This work, though eagerly welcomed, becomes monotonous if not varied, and two other lines of instruction may be pursued:—Drawing from the solid, and Brushwork. One day a week to each of these keeps interest alive in all. It may often be well to let this course trench on the "occupation" hours, which at this age are not easy to fill, for the Kindergarten occupations are despised, and hands are too weak to be of much use at Carpentry.

* As these lines are passing through the press, the methods in use at the School of Industrial Art at Philadelphia have been brought to our notice. These, combining bold freehand drawing by both hands using hard and soft point, with modelling and direct observation of Nature, seem to promise great results. Full particulars of the method, and an account of results obtained, are to be found in *New Methods of Education*—J. Liberty Tadd. Sampson Low, Marston & Co.

† Excellent examples will be found in *Colour Work*, or *Hand and Eye Training*, by G. Ricks, B.Sc., Inspector of Schools, and Joseph Vaughan, Art Master and Organizing Teacher of Manual Training, London School Board.

Term II. 40 Lessons.—The pattern drawing is very useful for building up the notion of unit distance, and intervals based on it; in this term patterns may be built up, still using squared paper, from interior guiding lines divided into halves and quarters, thirds and sixths. The Solid Drawing shaded with tortillons, and Brushwork,* will continue.

Term III. 40 Lessons.—Practical perspective may now be begun, the apparent diminution being shown by vertical and horizontal planes only, as a picture on a side wall, and a table viewed from one end. These are then combined to illustrate the perspective of regular solids, and with the aid of a transparent picture plane and a soap crayon, the leading ideas can be easily given. This is applied to rectangular and other model drawing, shaded in masses with tortillons as before. The brushwork and pattern work should still be continued.

Terms IV. and V. 40 Lessons.—As Term III.

Term VI. 40 Lessons.—It will now be possible to distinguish between the aptitudes of the children, and to apportion their work variously. There will be those whose sense of form is strong and that of colour weak, who may give up the brushwork and devote more time to the solid drawing, light and shade; those whose colour sense is strong and power of delineation weak, who must devote their time to the solid work without giving up the brush, finding the necessary time by dropping pattern design; and those with an aptitude for design, who may extend their pattern drawing. Groups of solids in light and shade—common objects of good form, and vases; free brushwork from living plants; and conventional floral forms (for pattern drawing), will give the material for use.

Term VII. 40 Lessons.—The same material in more advanced forms, groups of solids, rectilinear and involving

* Useful examples will be found in *Brushwork*, by E. C. Yeats. G. Philip & Son. Elementary and Advanced.

curved forms—plaster casts of floral types for black and white; actual "still life" subjects for the more advanced children, and for all, architectural drawing from models,—will occupy this and the succeeding terms up to the XIIth. These architectural studies are specially valuable for the majority who have but feeble artistic perception, but who can be guided to that sense of proportion and to that perception of light and shade which is its foundation. The very few who have no power of draughtsmanship at all, may be taught to treat them quite geometrically by orthographic projection.

Manual Occupations. 240 Lessons.—"The object of all such exercises is to train the eye to accuracy and rapidity of observation, the hand to skill in execution, and the mind to a sense of the importance of truthfulness in work. These exercises also teach the children not only to observe, but to interpret what they observe, and to describe it. They cultivate habits of neatness, of orderly arrangement, of accuracy in measurement, of attention to small and apparently trifling details."* In the early terms, paper cutting, cardboard modelling and modelling in clay, and chip carving, afford ample material for valuable manual training.

After the tenth year is completed there is perhaps no better exercise than the Sloyd woodwork, with or without variations. We extract from the Parliamentary Paper above quoted the following admirably descriptive passage.

> "Sloyd," says Herr Salomon,† "is a system of educational handwork. On the continent, the term 'Sloyd' embraces many useful forms of handicraft. The term 'Sloyd,' in England, is generally understood to mean a system of handwork in wood. Why, then, do we not call it carpentry? Because it differs from carpentry in several essential features. Carpentry is a trade, and the principles which underlie it are entirely utilitarian; whereas Sloyd is solely a means of formative education."

* Parliamentary Paper, c. 8,923 of 1898. *Final Report of the Commission on Manual and Practical Instruction.* Eyre & Spottiswoode, Fleet Street, E.C. 7½d.

† *The Theory of Educational Sloyd*, by Otto Salomon, London, 1892, p. 1.

"As Herr Salomon goes on to explain, the purpose of this branch of school-work is quite different from that of instruction in the trade of carpentry. The object of Woodwork in the primary school is not to turn out carpenters, but to develop generally the faculties of the children. Nor is its usefulness in this respect confined to the development of their physical powers. It cultivates, no doubt, manual dexterity; but it also cultivates carefulness, self-reliance, accuracy, patience, perseverance, and other useful points of character. It trains, too, the faculty of attention, and develops the power of concentration. Indirectly, moreover, it has the advantage of inspiring a respect for the work of the artisan, and for those who are skilled in any branch of it.

"This may be the most convenient place to state in outline the salient points of the Swedish system. That system is worked out through a series of objects, technically termed models, which are to be made out of wood. These begin with some exceedingly simple objects, such as pointers, letter-openers, labels, and the like. In the typical Sloyd course for boys at Nääs, there are fifty such models, and thirty in the course for girls. They are so arranged that each represents some slight advance upon the one that preceded it in the course—either some new tool, or some new use of a tool previously employed, being introduced in the making of it."

The utmost importance is attached to having each object, when made, the work of one individual pupil. Division of labour is rigorously excluded from the system; so much so, that whenever it is necessary for the teacher to show the pupil how any particular part of the work is to be done, he is to show this, not by doing a portion of the pupil's work for him, but by giving the demonstration upon another piece of wood. Self-reliance is one of the points of character to be developed by the system, and so the Sloyd Model, when completed, must be, from beginning to end, the individual work of the pupil who made it.

In the Swedish Sloyd system, mere approximations to accuracy receive no toleration. If, for instance, a piece of wood is cut in any appreciable degree too short for the particular model that is to be worked out, it has to be put aside as unsuitable for the work then in hand. The same check upon inaccuracy is applied even in the case of an almost completed model, if, after days of work, some want of attention to a minute detail has led to a mistake which makes it impossible to complete the work to the dimensions laid down in the drawing.

With the view of removing, as far as possible, all ground for misconception as to the nature and objects of this branch of school-work—the subject being one that may very easily be misunderstood—we think it useful, also, to quote the following observations of Herr Salomon upon another point of considerable importance in the system.

> "The objects," says Herr Salomon, "which the child makes are equally useful with those of the carpenter; but, unlike the work of the carpenter, the value of the child's work does not exist in *them*, but in *the child* that makes them."

Unmitigated Swedish Sloyd is perhaps a little too complex, but the enthusiasm of the specialist will surely be tempered by constraining circumstances.

These occupations may conveniently be interspersed among drawing lessons, and occupy wet days. For the class of boys we are considering they are not so much required as in primary schools. During the summer months no occupation is better than gardening, on which quite little fellows will be warmly interested, and where a whole class can work on a common object. Here, however, it is not fair either to the boys or to their parents to set them, as I have seen done, to regular tasks of weeding or sweeping, *à la* Squeers, to the complete neglect of all instructive and interesting gardening.

These courses are our scheme of instruction from eight to twelve years of age. They have of course no claim to

finality; paper programmes are made to be modified. But, so far as it has been tried, this is found to work well, and our contention is that, before the instruction in our expensive class schools can be deemed to be satisfactory, some similar scheme, by clear and definite steps, must be worked out and carried into practice by its staff. And parents must realize that a boy cannot profitably be sent to a school at any age, and at any time of the year, to be thrust into any form of boys about his own age and capabilities; but that all rational instruction is part of a planned and ordered whole, and that the instruction given by schools which have not some definite and consecutive syllabus is, for the bulk of their boys, distinctly inferior to that of the schools under such Boards as those of London and Birmingham, which have it. And this is true of scores of schools which charge fees of £90 a year and upwards all over England.

Such courses, we claim, will fit a boy of twelve years of age to enter profitably on more formal teaching. He will be well supplied with definite ideas of his own in all the branches of instruction he has gone through, will have been accustomed to observe and to describe with care and accuracy; and, above all, he will not be tempted to consider that his lessons have no connection with the world in which he will be ultimately called upon to play his part.

Chapter VII.

WITHOUT OVERSTRAIN.

"Let no one think that he can conquer the first expression of his youth. If he has grown up in enviable freedom, surrounded with beautiful and noble objects, in constant intercourse with worthy men; if his masters have taught him what he needed first to know for comprehending more easily what followed; if he has never learned anything he requires to unlearn, if his first operations have been so guided that without altering any of his habits he can more easily produce what is excellent in future; then such a one will lead a purer, more perfect, and happier life than another man who has wasted the force of his youth in opposition and error. A great deal is said and written about Education, yet I meet with very few who can comprehend and transfer to practice this simple yet vast idea, which includes within itself all others connected with the subject."—Goethe, *Wilhelm Meister*, Bk. ii., ch. ix.

1. The Modern Ideal—Directive Ability. One of the admittedly unsolved educational problems of the present time is how to inter-relate the different branches of instruction so that they may be of mutual assistance. This is likely to remain an unsolved problem so long as the early school years divorce the formal and deductive "First principles" from the real, empirical, inductive first principles, whose union is fruitful of satisfaction, understanding, and progress.

But if teaching units are substituted for the condensed extract of knowledge of the ordinary text-book, the problem takes a different and much more manageable aspect. It then becomes the selection of mutually illustrative teaching units, and the handling of these so as to bring out the same fundamental concepts from different points of view, or in different applications. This is being practised both in Germany and America, and is often called "Concentration,"

meaning the focussing of a group of such teaching units on some leading idea which is at that moment the dominating idea of the group.

The term, however, has fortunately not yet been adopted in England, and as it opens the door to a certain confusion of idea, a short examination of it may not be out of place. Concentration of aim, determining the choice of subject matters themselves (*i.e.*, the making of the curriculum), and the allotment of time, necessarily results from a definite ideal in the mind of the teacher. When this ideal is very distinct, *i.e.*, when the teacher knows exactly the end he intends to reach, and the means he intends to use, the concentration of aim will lead to kindred subjects being chosen, and to their being handled in such a manner as to be mutually supplementary. Concentration, therefore, deals with much more than correlation. It expresses the general means of attaining the fixed ideal underlying the whole educational scheme; it includes its physical and moral, as well as its mental, discipline; it is as the unifying concept of the architect which gives character to the building, and usually will depend upon deep-lying national characteristics. "To ride, to draw the bow, and speak the truth," expressed the simple concentration of the conquering Persian: nothing but that which could strengthen military hardihood seemed to him worthy of notice; an ideal which recurs wherever there is rough work to be done on a large scale. Greek concentration dealt with athletics and music, with the literature, grammar, rhetoric, and philosophy of the mother tongue, and was a concentration on national culture as expressed by the individual cultured man. The ideal was distinct, and therefore the concentration of instruction was natural and easily understood.

Not less distinct though widely different was the (theological) unifying idea of the mediæval schools. The Trivium (grammar, rhetoric and dialectic) and Quadrivium (arithmetic, geometry, astronomy, and music), studied mostly in

Latin and all given a most curiously theological turn,* were the faculty of Arts of the XIIIth. century: that century whose chief thinkers were Bonaventura, Aquinas, Dante, and Scotus—each an exponent of the theological spirit,—and Roger Bacon, of reaction from it.

So with the concentration of the Renascence, that mould in which our present public school curriculum was cast; it was an ideal of scholarship, form, and style, to be attained by a study of Greek and Latin poets whose productions then seemed a poison-spring to orthodox Europe. They were denounced in unmeasured terms by a clergy who had the monopoly of education, and could scarcely have gained the currency they did but at a pontifical Court which, if it did not disbelieve Christianity, was much too fully occupied with literature, art, and luxury to think much about it. By the XVIIth. century an "Artiens" had become one who had studied the classic models of style, and was a good Platonist. Somewhat changed by a century and a half of slow adaptation, and given a fair scope, this ideal of scholarship and style was successful in providing for the needs of a limited aristocratic class in XVIIIth. century England. It made a boy who had gifts either way into "a scholar and a gentleman"; and presupposing him also a man of property, in a society changing but very slowly, the resulting High Tory of the days of Chatham was a genuine product of a thorough system. Definiteness of ideal again resulted in all educational forces being focussed to one end.

Modern democratic pressure, which, like that of the common air, is felt in the highest as in the lowest places,

* *E.g.*, "It is difficult to realize 'Grammar' taught out of 'Donatus Moralizatus.' 'What is the *pronomen?*' the learner was made to ask. 'Man is thy *nomen*,' the teacher answers, 'Sinner is thy *pronomen*. Therefore, when thou makest thy prayer to God, use thy pronomen only and say, 'O Heavenly Father, I call not upon Thee as man, but I implore Thee as sinner.'' Again, 'Why,' the learner asks, 'is the preposition the joy of the Elect?' The answer is, 'Quia illi præponuntur damnandis.'"—Matthew Arnold, *A French Eton*, p. 234.

has imposed on us a different ideal than that of the lilies of the social field. This ideal is not, like that of the Greeks, the result of profound national conviction and intensely national character—our patriotism deals in cottons rather than in ideas ; it does not spring from the strong religious convictions such as animated the Schoolmen, nor from those which covered Protestant Germany and Switzerland with schools, and called forth the magnificent reply of the Jesuit Colleges, still said to be the best in France; it has no traceable relation to any outburst of artistic and literary fervour such as moved Medicean Italy, still less is it due to any far-sighted conviction of the potency of education as a means of national success; such truths make way with much difficulty, and usually require distinct object lessons. Prussia learnt them at Jena in 1807, Denmark at Düppel in 1864, Austria at Königgrätz in 1866, and France at Sédan in 1870, when the results of order, forethought, and system, and of the high efficiency which is only possible in a nation which has a high standard of education (as well as energy, courage, and national honesty), had, in the long years of peace, perfected the national organization which leads up to the climax on the fields of war.* This demand for DIRECTIVE ABILITY, though limited to no special time in the world's history, has with growing Democracy now necessarily come into most marked prominence, and is perhaps all the more unalterable that it has not sprung from the impulse of any one man or party, but is the result of many intricate forces which are leading our age in paths of which it is unaware. It is a demand, not that minds shall be artificially "moulded," but that they should have the best conditions of growth. This special though unformulated and inarticulate demand by our English upper middle class,

* War against a Power on the same political level. Frontier wars and expeditions against savages, however well conducted and however useful, are not to the point here, for they do not test directive ability in the same way as a struggle with a Power of equal rank.

has already led to wide departures from the hallowed classical curricula of our nine great bulwarks of English education—Eton, Winchester, Westminster, Charterhouse, St. Paul's, Merchant Taylor's, Harrow, Rugby, and Shrewsbury, though it has not yet given any unifying idea to the chaotic mass of English school instruction. The complexity of the ideal itself, the different meanings it bears to different classes, and its inclusion of physical and moral conditions which should, and might, be common to all classes, are sufficient explanation of this. Not only does its full realization imply robust health, strong and skilful hand, and yet more a clean and resolute heart, but even its intellectual conditions—understanding, skill, and "that instantaneous preference for the noble over the ignoble which constitutes good taste,"* are not to be reached by any one line of training alone. To these facts may be set down both the over-pressure which has loaded the curriculum with "subjects," and the absence of unifying idea in dealing with them.

2. Correlation of Studies. The ideal has grown, it has not been manufactured, and for it no other, however dear to the theorist, can be substituted. It is due to elemental forces working in society, and is the natural expression of a nation which has led the van of that commerce which is the honourable and honest interchange of those products of invention, organization, skill, and labour, whereby all units of a nation can be usefully and honourably employed; whereby a worthy civilization is built up, and whereby alone improved conditions of life are made possible to all. Leaving out only some very small classes, all men are employed in the production, preparation, and distribution of commodities; and these duties, conducted in the same spirit of resolution, perseverance, and honour which dignifies War, is visibly the appointed agent of a higher

* Ruskin.

civilization, because they are, under scientific direction, the means of mutual aid, support, and independence. Pressure of population, commercial rivalries, extension of political responsibility, historical traditions, and national temper, have created the conditions, and it is now possible to formulate a policy to meet them.

The English concentration of aim is on DIRECTIVE ABILITY in its widest sense, with particular applications for those who are born to direct the actual forces of Nature in the foundry, the laboratory, the farm, the workshop; and for those who, as captains of industry or officers of the Queen, use the products of these for the wider ends of commerce, war, or administration. The ideal is complex, and therefore the means are complex also. First and foremost comes the healthy republicanism, discipline, and social life of the public school; but even in merely mental instruction three chief lines of training are demonstrably required — the Humanist, the Realist, and the Manual. These have determined the curriculum, and items from each of these, imposed by public opinion or by technical necessities,* have strained it to the breaking point.

In that which is here proposed (Chap. VI.) we have taken things as we find them in our schools; inventing but little, and only making a somewhat different allotment of the usual subject matter of a modern liberal education. The resulting table is formidable if all these things are to be taught in water-tight compartments. Some great economies of time and energy are now imperatively demanded.

Two are practicable, and mutually supplementary. First, the substitution, at least for younger boys, of the Herbartian teaching-unit for "preparation" which is "heard" in school time. Second, the inter-relation of the branches of instruction by the selection of teaching units dealing at any given age with the same fundamental ideas, broadly called

* Such as the requirements of Examining bodies for the Medical, Military, and Naval professions.

"Correlation." Both, it will be observed, are matter of detail and method pure and simple: they do not govern the aims of education nor the resulting curriculum, but are applicable to any curriculum soever. But given the high standard which is now demanded, they seem to the present writers a promising means whereby that standard may be attained without overstrain.

The first of these reforms—the adaptation of teaching method (1) to the general laws of mental working, habituating the child to attention, observation, correct reasoning, and clear, definite statement; and (2) to the particular age of the child, has already been discussed in Chap. II. The second we have now to deal with.

The problem of Correlation has been attempted both in America and Germany. In the former country, certain teachers select, on more or less abstract ground, some branch of instruction as the chief one for each school year, and subordinate all or most others to it. This is at least one leading American method. Geography has been so selected for the junior years, and will serve as an instance of what may be called ancillary correlation. There is much to be said in its favour. "We live on the Earth, its products nourish us; to direct its energies is the business of our lives —the fulfilling of the command to replenish and subdue; our use of its possibilities for production is the measure of our national prosperity; its seas are the highways for that Federation of English-speaking races which lies before us; and though those applications of Geography are not those for tender years, the percepts on which they rest are for most men formed then or not at all. Moreover, sound geographical teaching (not mere names and distances) links, quite naturally, History on the one side with the Natural Sciences on the other." It is therefore a tempting field for this kind of correlation, and accordingly its lessons have sometimes been taken as central, and other items of instruction have been grouped around these.

In Professor Rein's seminary at Jena another and more complete system of Correlation has been carried out. It may be studied in the Year-Books published by him (Mr. D. Nutt, Strand, W.C.), by those whom lack of leisure or linguistic difficulties debar from attending the teaching classes so highly praised by those who know them. In these there are at least three distinct lines of aim—Instruction of the disposition, chiefly by Biblical History: of the observing and reasoning faculties, chiefly by Nature subjects: of the power of expression, by Language, and Art studies. Hence there are three distinct lines of Correlation. Thus while the children's Bible reading deals with the Captivity in Egypt, they are given an Egyptian *locale*, they model Egyptian columns, pyramids, and lotus blossoms, and their Geography deals with the Nile Valley. The games of spring, and the ball as the primitive form with which children are acquainted, leads to the simple Geometry of the sphere, and the time of year is related to the studies of the school walks, which are also made opportunities for practical Geography. So also the subject matter of both German and Latin linguistic instruction is the same (*e.g.*, the Trojan War), and consecutive steps in Grammar teaching are taken in the native and the foreign tongue at the same time.

The correlation turns upon the idea dominant from week to week, and does not make any given branch of instruction merely ancillary to others. The correlation is of idea, and dominance is naturally transferred and alternated between the three chief aims, according to circumstances and occasion.

With any system of ancillary subjects there is a danger that their chief purpose may be lost sight of. Presumably each has its place in the curriculum assigned to it for its own sake, and on the supposition that it is thoroughly learned, not in order that it may subserve some ulterior purpose; and the adaptability of Professor Rein's elastic procedure will no doubt secure its general adoption. It

may be facilitated by framing the syllabus on really elementary ideas and first principles, so as to facilitate the interlocking of teaching steps, for this gives a ground of agreement in natural laws. Hitherto the bar to an effective correlation has been the artificiality of the basal ideas. If these central ideas were to be arbitrarily determined according to each teacher's notion of the value or purpose of each branch of instruction, there would at once be an end of all scientific teaching, for scientific procedure depends on generally admitted and formulated principles; the central idea must always be the real essence of each matter of instruction. The real inductive first principles of each branch of study supply a natural basis for correlation. Nature subjects, for instance, are linked by the same concepts of distance, area, weight, mass, volume, and number, in their earlier stages, and, later, by the laws of force in their different manifestations. The same principles reappear again and again in varied forms, and are mutually complementary; and this is true from the very earliest stages of conscious mentation. Multiplication, as repetition of unit distance or unit group, is common to a hundred matters in Geometry, Geography, and Physics, and the same is true of the other fundamental arithmetical operations. So with concepts of distance and area, which bring Geography and Geometry into closest relations;* and the list might be extended to include most, if not all, of the really primary concepts. Occasional connection between such physics lessons as those on earths and metals, and those of History dealing with the buildings, arts, and arms of primitive races, and with the modern workshop, can also be made, and will open the mind to the essential unity of all laws in Nature, and obviate the fatal tendency to put all

* A child who has roughly computed the number of square miles in a country by a large scale map, drawing the squares, counting them, and then working out by rule, is using the geography lesson to form arithmetical and geometrical concepts.

that is learned into pigeon-holes of memory, rather than to see constant applications in the things around us.

Lastly, there is the correlation which intelligent teachers habitually practise, the giving illustrations from the History of one country to that of another, using maps with all history teaching, pointing out the applications of class-room conclusions in the great world around.

This, in sum, is the system of *Correlation*, which, by forming genuine association pathways in the brain, results in a very distinct relief to the present pressure on time and energy. Its development is mainly due to Professor Rein's Year-Books above quoted, and his *Principles of Pedagogy*, to which I gratefully acknowledge my indebtedness. He is, I am told, optimistic in his faith in the improvement which the general adoption of better teaching methods will bring about. This is the faith of a Columbus, a Magellan, or a Faraday, in the laws which govern the forces which produce results. If we cannot distinguish this temper from that of the self-confident faddist, the loss is our own.

Correlation, in brief, may be defined as :—

(*a*) The selection of teaching units dealing with different aspects of the same fundamental idea, and the application of the same fundamental concept in different ways ; and

(*b*) The handling of each of these selected units so as to be illustrative of what is brought before children in other classes during the current term, or in daily life.

In practical school work the former is a matter to be settled by the curriculum, the latter for consideration at the masters' meeting and for individual practice in class. Any teacher with his heart in his work, working on a definite and well-balanced school curriculum under a head-master who fulfils a director's functions and brings his set- and form-masters together to concert unity of action, will find numberless instances for correlation by treatment of the

teaching units for the coming week in a manner which will fit with those of his colleagues.

3. General Correlation of the Primary Course. There are, then, at least three means of correlation open to us, each of which will find its use, and we now address ourselves to the correlation tables which partially illustrate its practice. They are, of course, necessarily incomplete; and it must again be remarked that the chief purpose for which any branch of instruction is placed on the curriculum must never be sacrificed to any other—it is easy enough to show a charlatan's correlation by making concessions of this principle. Scrappy correlation, which impairs or destroys the general sequence, is worse than none. The numbers designate branches of instruction from Table I., p. 138, and the general purpose of the whole course, primary and secondary, is here repeated, because this must always be kept in mind throughout all attempts at correlating treatment.

English Composition and Grammar (1).—Up to 11 years of age the ruling idea is simply good verbal expression and good handwriting and spelling; the subject matter of dictation and copy writing may be entirely ancillary to other subjects. Nos. 2, 17, 15, or 19 will supply plenty of material. Every branch of instruction must subserve the main end in this—good verbal expression; but it is chiefly attained by always making children answer in class by complete sentences of good English.*

After that age, accuracy of written expression becomes the dominant purpose, both as to grammatical form and as to clearness of idea; and here again the subject matter of composition may be taken from real interests aroused in

* The answer given in the teacher's own words secures this result without the friction and distraction of correcting. *e.g.*—*Q.* "What is the difference between a hard thing and a stiff thing?" *A.* "The difference between a hard thing and a stiff thing is that the hard thing cannot easily be dented, and the stiff thing cannot easily be bent."

other branches, instead of the meaningless or quite too abstruse matters which are usually set for essays. "The Advantages and Disadvantages of Conscription," "The Advance of Russia in Asia," "Compare the National Characters of Russians, French, and Turks,"* are three consecutive subjects for essays set last term to my own son of 14½ in a large public school. What can such training do but encourage the use of words to conceal the absence of ideas, which continually adds to the flood of irresponsible talk and writing in which our minds are drowned, obscuring the fact that the first necessity for speaker or writer is to study and know the truth on what he deals with, as far as it may be known. Essays set on matters dealt with in classes would, by arousing real interests, be a most valuable help to these, while making the grammar and composition much more effective, because applying language to the purpose of conveying ideas instead of to filling a sheet on matters of which the writer has no ideas at all.

History (2).—This, involving all the activities of a nation, political, literary, scientific, and artistic, is the chief Humanist interest. Its dominant purpose—to give clear mind-pictures of the races dealt with, their works, and their surroundings—has already been developed. It will find its correlatives in English (1), to some extent in Drawing (24), —where the selection of Celtic, Norse, Greek, Roman, or Norman forms of pottery, arms, and architecture, helps the realization of the works of these races,—but most in Geography (15), which, presenting both by map and landscape (lantern work) the habitat of a people, or their field of action, becomes an invaluable help. Also in Drawing and Modelling, the typical forms of pottery and weapons. This is eagerly welcomed, and the potter's wheel enjoys large popularity.

French (7) and *Latin* (4).—The first purpose at the early

* Another exercise out of many such set to boys of 13—in another school—was to "Describe the Character of the German Emperor."

age (8 to 12) is to give a vocabulary, and during these years little can be done but to use the same set of ideas in each (*e.g.*, the parallel system of phrasing, grammar, and subject matter worked out by Messrs. Swan, Bétis, and Sonnenschein). The English grammatical construction will follow the same lines.

When the vocabulary has been acquired, language lends itself in an unparalleled degree to correlative treatment. Not only can the history of Rome and France be given in Latin and French respectively, but the use of maps and plans with such books as *Cæsar's Gallic War*, renders these living records instead of dull lesson-books. Every language in its second stage must, to be living instruction, be used to convey as much of the literature and thought of the nation as time allows.

Arithmetic (10), *Geometry* (11), and *Physics* (19) are so closely related, that if boys are taught on first principles, and taken through the inductive stage, these branches will almost correlate themselves. Let the Arithmetic deal with actual lengths, areas, values, masses, volumes, scales, and their parts, and with problems suggested by these. Let Geometry deal with actual cut out areas and the lengths of their boundaries, and comparison of these—not with lines, which at first confuse the child—with areas as multiples of each other; and with the square, oblong, and triangle as sections of prisms, and the circle as section of a cylinder and of a sphere; and, in brief, let it repeat the actual history of Geometrical discovery,* which early Egyptian manuscript clearly shows to have consisted of empirical and tentative rules. Let Physics deal with concrete forms and forces, which *have* relations of number and magnitude,

* See a most instructive paper, "The Genesis of Geometry," in the *Journal of Education*, September, 1898. Benchara Branford. The papyrus is one attributed to 1700-1100 B.C., in the Rhind Collection, British Museum, and is thought to be an epitome of the hieratic geometrical knowledge. It is a set of empirically discovered rules.

and there will be no difficulty about finding their relation to the sciences of number and form. And if Algebra is generalized arithmetic, as all the text-books correctly state, then in the name of all common-sense let us make it so, and discover our "rules" inductively from arithmetical instances, as matters of reason, and not as Formal teaching.

Geography (15) has as its main purpose (*a*) to familiarize a child with the locality, form, products, and conditions of other parts of the Earth, and (*b*) to enable him to understand and read a map, translating its diagrams into a mental picture of heights, slopes, and distances, which so few people can do. It is obvious that geographical knowledge of the former kind must necessarily and always be fragmentary, extending only to a few of the chief countries of the world, and that the latter can be taught by any examples. To be able to read the maps of England, Greece, and Norway, is to be able to read any map. This branch of instruction is therefore more or less ancillary after its first stages; as soon as the class can understand, read, and draw a map, then Geography should follow their History, and deal with the country of the people whose life and thought is there presented. For this purpose the use of the optical lantern is so valuable a help as to be almost essential. In its later stages, Geography is linked to mechanics and the natural sciences, when the local geography can intelligibly be expanded into Physiography and Astronomical Geography.*

Botany (17) is not intended in this course to serve any purpose but familiarity with Nature, and to keep alive that intelligent faculty of wonder so general in childhood, and so easily quenched by dry formal instruction. It is not here

* To begin with the sphericity of the Earth, as is usually done, is to omit the whole inductive stage of the science; and to begin with a scientific concept so difficult and so opposed to visible experience, that children do not as a rule connect it with actuality at all. Many mathematical ideas are required before there can be any real knowledge of the form and motions of the Earth.

treated as a science of classification, but as an observation, first of forms, and then of functions of plants. It will correlate only with an occupation such as gardening, though studies of flax, cotton, wheat, timber trees, etc., may now and then help out a Geography lesson.

Physics (19) is taught primarily in order to carry the child through the sequences which lead to an adequate acquaintance with the physical, chemical, and vital properties of objects round them, which is the order of knowledge underlying the right performance of those processes by which civilized life is made possible;* and in the second place, to habituate the learner to observe attentively, and reason upon his observations. The inductive stages of this sequence interlock, by means of actual measurements and computations, with Geometry, Arithmetic, and by plans and sketches, to some extent, with Drawing. For want of strength and skill in young boys, applications in the workshop cannot well be made, but after ten years old the making of simple apparatus is a correlation which excites the interest, the ambition, and the efforts of certain boys to a quite unparalleled degree.

Drawing (24).—The ruling idea is to give facility of expression and manual skill, which may in a few instances go on to real artistic training; and this can be given by very various "studies," which can often be selected to correlate with 15, 17, 19, and 2. Early work will be almost identical with Geometry (11), for a child's Geometry is soon almost identical with geometrical drawing. The Drawing lessons may often be in the history, geography, or botany note-books. Nothing maintains interest like the sense that work is being done with a visible purpose.

Workshop (23).—The chief purpose of giving manual instruction is to develop manual dexterity. Incidentally this subserves other purposes—respect for that skill which is so unexpectedly hard to acquire; the appreciation of the

* Herbert Spencer. *See* p. 70.

enormous difference between talking of a thing and making it; between theory and practice; the accuracy which successful manipulation demands. If the workshop instruction is made the transition from Saying to Doing, the correlating principle is obvious.

In the earlier stages, cardboard modelling, chip carving, and clay modelling, afford a varied field of occupation and for the realization of form in relief, and the potter's wheel is rejoiced in; while Sloyd carpentry slowly develops the manual dexterity which makes more varied occupations possible in later years. The making of physical apparatus, mechanical and geographical models, photography, lantern slide making, are but a few of the great variety of workshop occupations wherein each boy may be largely left free (with two provisos) to follow his own bent. These provisos are (*a*) that everything begun must be finished, and (*b*) that much of the work should be co-operative, for a purpose required either by the class as a whole, or at least by some considerable part of it.

4. Outlines of Correlation. These are the principles, but correlation is almost entirely a matter of detail and practice. The theory runs glibly enough. We give, therefore, the outlines of the instruction for these years term by term. The teaching units are those summarized in Chapter VII., with which the present tables may be compared. The complete correlation can only be seen from the actual lessons, which we trust to publish as a Year-Book; only a few of the leading ideas common to the various branches of instruction can be given in these short abstracts.

Term I.

Normal age 8—8⅓ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Objects and pictures from (2), (15), or (19), described orally and correctly written.
(2) History.	30	The Celtic type:—physical appearance, works, customs, and religion.
(7) French.	90	Oral exercises in simple sentences on visible objects, using ordinary objects of common life.
(10) Arithmetic.	60	Addition and subtraction of visible groups and of linear units—inches and centimetres, yards and metres, etc. Examples from the Physics and Geometry, also from Geography.
(11) Geometry.	20	Lines—straight, curved, and crooked; use of ruler, and scale of centimetres and inches.
(15) Geography.	30	Direction, distance, and level; to understand and represent them by lines, using the Arithmetical and Geometrical concepts.
(17) Botany.	10	Plants:—their organs, root, stem, leaves, and flowers. Chief forms of the seed, and its growth. Forms of roots.
(19) Physics.	30	Basal perceptions of taste, smell, colour, and form. How to measure length exactly. Weighing.
(23) Workshop.	20	Modelling in clay, or chip carving. Practical use of ideas of dimension in making clay models of Celtic pottery and arms.
(24) Drawing.	40	The straight or curved line, as the edge of a patch of colour or shade; its use in pattern drawing. Solid drawing from models of Celtic weapons and pottery, fixing the ideas of Celtic taste and industries. Simple forms involving straight line; also plant forms (brushwork).

Free time reading—*Celtic Hero Tales.*

Term II.

Normal age $8\frac{1}{3}$—$8\frac{2}{3}$ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Oral description as before, ancillary to subject matter of (2), (15), (17), or (19), and dictation as before described. Simple accidence—noun, adjective, and verb.
(2) History.	30	The Roman type:—physical appearance, works, customs, and religion. Roman Army—its conquest of Gaul and Britain.
(7) French.	90	Oral and written exercises. Easy sentences on visible objects. Conversational work, using noun, adjective, and verb.
(10) Arithmetic.	60	Multiplication, exemplified by units of area and solidity (square inch and square centimetre, etc.), using the physical concepts.
(11) Geometry.	20	Nature of the circle, and some of the properties of this form of area. Use of the compasses.
(15) Geography.	30	Anatomy of the district worked out in areas and directions; modelled in clay (plasticine). Number of units of actual area on the model; what they stand for; total area by multiplication.
(17) Botany.	10	Chief forms of the stem; place of buds and growing branches.
(19) Physics.	30	Lines, areas, and masses compared. Forms of masses, measurement and gauging of masses. The "cubic inch" may have any shape. Form distinguished from mass.
(23) Workshop.	20	Clay modelling, illustrative of Physics and Geography, as well as imitative modelling.
(24) Drawing.	40	Repetition (multiplication) of the unit to form a pattern. Solid:—Roman arms, and fictile ware drawn from models. Plant forms; freehand, circular and elliptical curves.

Term III.

Normal age $8\frac{2}{3}$—9 Years.

Matter.	Lessons.	Progress.
(1) English.	20	Oral and written descriptions as before. Terse simple sentences and accidence of verb, noun, adjective, and adverb.
(2) History.	30	The Norse type :—Physical appearance, works, customs, and religion.
(7) French.	90	Oral exercises on the verb and nonn. Simple question and answer in different moods and tenses. Reading and writing from the black-board.
(10) Arithmetic.	60	How to divide units and groups, and to write this down. Examples in length, areas, and masses.
(11) Geometry.	20	Principle of the circle, discovered, and applied to draw other figures.
(15) Geography.	30	Anatomy of the British Isles—chief water-sheds, valleys, and rivers. Map drawn, then modelled in relief. Area worked out. Supplementary to History—Geography of Scandinavia.
(17) Botany.	10	Stems and leaves—their various types as shown by common plants.
(19) Physics.	30	Earths, ores, and metals—the physical properties of some common examples of each. Descriptions based on previous work of Term I.
(23) Workshop.	20	Modelling in clay, occasionally varied by chip-carving or cardboard work. Related to (15).
(24) Drawing.	40	Use of the circle in tangential and intersecting patterns. Solid drawing and modelling —Norse ships and weapons.

Free time reading—Stories from the *Younger Edda.*

Term IV.

Normal age 9—9⅓ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Oral and written description, as before, of places and scenes visited, and ancillary to (2), (15), (17), or (19). Simple syntax. Subject, verb, and object. Accidence.
(2) History.	30	English Conquest. Extermination of the British Celts in England. Saxon England: its agricultural character and social customs. The Saxon type.
(7) French.	90	Simple objects and scenes orally described and written. History reading in French, parallel with (2).
(10) Arithmetic.	60	Arithmetic of money; application to this of the "four rules." Notion of equality of worth.
(11) Geometry.	20	The angle in a semicircle is a right angle: notion of equality and measure of angular openings.
(15) Geography.	30	Detailed anatomy of the British Isles: mountain and river basins of Scotland, England, and Ireland. Physical Geography of Scandinavia as required by (2).
(17) Botany.	10	Leaves, as parallel-veined and net-veined, reproduce the pattern of the tree. Forms of leaves.
(19) Physics.	30	Water—the common properties of water—the work of water in cutting valleys—rain, rivers and deltas—work of water in a river basin.
(23) Workshop.	20	Modelling in clay, varied according to ability and taste. Saxon pottery. Leaf forms in relief.
(24) Drawing.	40	Drawing of Saxon forms for the pottery. Pattern work, involving angles in circular segments. Brushwork, leaves, chiefly in Botany note-book.

Term V.

Normal age $9\frac{1}{3}$—$9\frac{2}{3}$ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Description and Dictation as before. Accidence on children's own sentences, on objects from (2), (15), or (19).
(2) History.	30	Roman and Celtic missionaries among the English. Short biographies, illustrated by map of Saxon England.
(7) French.	90	The seven irregular verbs and their idioms. Frankish biographies in French, parallel with (2).
(10) Arithmetic.	60	Arithmetic of area, solidity, and capacity, using the previously developed concepts—class to make their own "tables." Form distinguished from mass—deduced from parallelism of edges of square and sides of cube.
(11) Geometry.	20	Some properties of parallels deduced from the cube and the square in conjunction with the circle.
(15) Geography.	30	Physical Geography of the British Counties, with detail of special interest in each.
(17) Botany.	10	Buds and flowers. Stamens and pistil. Ovary.
(19) Physics.	30	Air—its weight and some of its properties. It is elastic, flows, passes on pressure. Comparison of solids, liquids, and gases—connected with (10).
(23) Workshop.	20	Modelling connected with the arithmetical mass models. Cardboard measures of volume.
(24) Drawing.	40	Solids as before. Brushwork—leaves and flowers.

Term VI.

Normal age $9\frac{2}{3}$—10 Years.

Matter.	Lessons.	Progress.
(1) English.	20	Reading aloud and paraphrase — subject matter chosen with reference to (2) or (15). Dictation. Analysis.
(2) History.	30	English Christianity: the work of Theodore, Cædmon, St. Hilda. Guthlac and Crowland. Abbeys as centres of industry and civilization.
(7) French.	90	Construction of sentences on pictures, historical or other. Daily conversation. French history reading (in French), parallel with (2), contrasting Frank and Saxon customs.
(10) Arithmetic.	60	Arithmetic of capacity—Metric system—unit the cubic centimetre. Practice in gauging. The decimal notation.
(11) Geometry.	20	Construction of plain scales—decimal subdivision of various units preparatory to next term's Arithmetic.
(15) Geography.	30	Physical Geography of British Counties continued. Geography of Central Europe, in preparation for Charlemagne.
(17) Botany.	10	Uses to the plant of all its parts. Cell tissue and growth, using the lessons on the properties of water.
(19) Physics.	30	Gravity and weight. Centre of gravity of known geometrical forms. All measurements to be decimal.
(23) Workshop.	20	Modelling, &c., as before, connected sometimes with work done in Arithmetic.
(24) Drawing.	40	Groups of solids. Brushwork. Pattern work to scales.

Term VII.

Normal age 10—10⅓ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Dictation, Reading, and paraphrase, as before. Analysis of sentences, subordinate clauses.
(2) History.	30	English (Saxon) interests: agriculture and social life. English Law (common law), trial by Jury, folkmote. Constitution of society illustrated by stories.
(7) French.	90	Easy Composition. Conversation. Oral and written questions, and answer exercises on history reading (Charlemagne and his Times), parallel with (2).
(10) Arithmetic.	60	Decimals. Addition, &c., of various decimal lengths, areas, volumes, weights, and moneys, each being shown where possible.
(11) Geometry.	20	Tangents: the passing from a circular direction to a straight one—drops leaving a wheel in motion. Properties of tangents.
(15) Geography.	30	Geography of Modern Britain. The County—its Saxon origin. Meaning of "Civilization" as administrative order. Natural boundaries of the Counties, limiting jurisdiction. Physical Geography of Central Europe, supplementary to (7).
(17) Botany.	10	Function of roots. Plant circulation.
(19) Physics.	30	Mass and momentum. First law of motion experimentally discovered. Tangential paths.
(23) Workshop.	20	Sloyd or other woodwork course, using drawn patterns. Modelling.
(24) Drawing.	40	Drawing for woodwork and for models occasionally. Other drawing work not correlated.

Term VIII.

Normal age $10\frac{1}{3}$—$10\frac{2}{3}$ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Written descriptions of places visited, &c. Analysis of sentences, as before.
(2) History.	30	The English Nation under Alfred. Rule of the King, rule of the bishop: *Cf.* Charlemagne. Danish Conquest.
(7) French.	90	Composition, as before, increasing in difficulty. Selections from modernized early French classics, *e.g.* Chanson de Roland. All French lessons given in French.
(10) Arithmetic.	60	Division of decimals, mostly physical examples from (19), progressing to abstract work.
(11) Geometry.	20	Tangents—continued.
(15) Geography.	30	Separate counties of Modern England : their scenery, chief towns, and products. English railway system. Supplementary — Physical Geography of Mediterranean countries, in prep. for Latin History.
(17) Botany.	10	Development of the ovules and ovary. Self-fertilization. Flowers with stamens only. Flowers with pistils only.
(19) Physics.	30	Pressure in grams per square centimetre, and lbs. per square inch. Pressure of water on a given surface, and at given depth (decimals only).
(23) Workshop.	20	Carpentry or Sloyd. Modelling of Roman architectural forms.
(24) Drawing.	40	Not correlated, except in so far as used for architectural forms.

Term IX.

Normal age $10\frac{2}{3}$—11 Years.

Matter.	Lessons.	Progress.
(1) English.	20	Dictation and Composition, as before. Regular grammatical analysis of sentences.
(2) History.	30	The English Restoration. Absorption of the Danes by the Anglo-Saxon element. Norman invasion and settlement. Social condition of England and Normandy compared.
(7) French.	60	Rapid general conversation. Selected newspaper extracts. History reading, Norman biographies, Lanfranc and others, and paraphrase.
(10) Arithmetic.	30	Factors. H.C.F. from concrete examples from Physics course and daily life—patterns to fit a given length, &c. &c. Use of decimals.
(12) Algebra.	60	The Equation as a basis of symbolic reasoning, treated arithmetically.
(11) Geometry.	20	Tangent circles, and problems arising from them.
(15) Geography.	30	British Counties, continued as before. Supplementary—Rome and the Roman Empire, preliminary.
(17) Botany.	10	Seeds and fruits — their leading forms, studied from Nature and drawn.
(19) Physics.	30	Laws of Flotation in water--upward pressure—balancing weight. Weight and pressure equalled.
(23) Workshop.	20	Carpentry or Sloyd. Modelling of Roman architectural forms, or typical fruits.
(24) Drawing.	40	Partial correlation by Roman architectural studies.

Free time reading—Selection of *Hereward the Wake.*

Term X.

Normal age 11—11⅓ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Meaning of "Composition:"—Clearness of idea, grammatical construction, balance of idea. Analysis of matter or analysis of form. Reading aloud (historical) paraphrased from memory.
(2) History.	30	The Feudal System in England as introduced by the Norman Conquest. Chivalry, its customs and surroundings.
(4) Latin.	90	Oral exercises in simple sentences on visible objects, as for the French using the accidence learned in (1) and (7). The Latin sentence—subject, verb, and object distinguished by case endings only. *Beginners' Latin Book* (Collas and Daniell), and the related *Latine Reddenda*.
(7) French. (8) French Hist.	30	French reading aloud—*La France Féodale*—original writers—paraphrased from memory, orally and in writing.
(10) Arithmetic.	30	Fractions—from division of visible concrete units and groups, then using examples from (19) fractions of lengths, areas, weights, pressures, &c.
(11) Geometry.	20	Computation of areas by geometrical reasoning. Fractional areas; proportion between different areas and their parts.
(12) Algebra.	40	Number in its abstract meaning. General cases of particular arithmetical cases of addition and subtraction. Derivation and algebraical (general) statement of the rule.
(15) Geography.	30	British Industries. Supplementary:—Geography of each part of the Roman Empire treated of in *Principia*.
(17) Botany.	10	Fruits and seeds continued. The pod as a folded leaf; description and drawing of fruits.
(19) Physics.	30	Specific gravity:—particular cases worked experimentally; the mode of procedure discovered, and stated both in words and algebraically.
(23) Workshop.	20	Carpentry or Sloyd. Modelling a Norman castle. Fruits and seeds.
(24) Drawing.	40	

Free time reading.

Term XI.

Normal age $11\frac{1}{3}$—$11\frac{2}{3}$ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Composition as before. Historical reading aloud, paraphrased from memory and written. Simple original essays.
(2) History.	30	Feudal England, continued.
(4) Latin.	90	Oral and written exercises on the verb, by question and answer. Reading and Writing from blackboard. Books as before. English, French, and Latin Grammar go together. The object is to bring the learner up to the point at which he can read easy Roman History, and express himself in Latin.
(7) French. (8) French Hist.	30	*La France Féodale.* Reading aloud French historical romance. Written paraphrase, as before, from memory.
(10) Arithmetic.	30	Fractions continued. The fraction as expressive of a ratio rather than parts of.
(11) Geometry.	20	Linear proportionals. Graphical representation of linear or other quantities. Ratio between lines.
(12) Algebra.	40	"Symbolical expression" of arithmetical concrete quantities, and deducing algebraic methods.
(15) Geography.	30	British Industries and Arsenals. The Navy and its growth. Government buildings and their uses. Supplementary Geography, as before.
(17) Botany.	10	Drawing studies of typical plant forms, dissection of the plant, or microscopic work.
(19) Physics.	30	Weight and pressure of the Air: experimental work on the same lines as that of Water pressure—reduced to words and to algebraical statement (Equation).
(23) Workshop.	20	Carpentry or Sloyd. Modelling—making of physical apparatus—handling of glass.
(24) Drawing.	40	Norman architectural studies.

Free time reading—*The Talisman.*

Term XII.

Normal age $11\frac{1}{3}$—$11\frac{2}{3}$ Years.

Matter.	Lessons.	Progress.
(1) English.	20	Composition and paraphrase as before. Original essay on actual experiences.
(2) History.	30	Historical work of the last three years summarized and reviewed. Chart of the History course described in detail.
(4) Latin.	90	Books as before. The Latin work is necessarily isolated till fair fluency is attained.
(7) French.		
(8) French History.	30	Summary of Historical reading put on History chart.
(10) Arithmetic.	30	Fractions, "continued fractions"—interconversion of vulgar fractions and decimals.
(11) Geometry.	20	*Euclid*, Book I. Concrete examples of the application of the principles.
(12) Algebra.	20	Multiplication and Division as statements of a process. Use of brackets, applied to the Equation.
(15) Geography.	30	Shape and motions of the Earth based on previous arithmetical and geometrical concepts; drawn to scale.
(17) Botany.	10	As last term.
(19) Physics.	30	Barometer and pressure gauge — use and theory of these. Pressures computed in millimetres and inches of mercury. Algebraical statement.
(23) Workshop.	20	Making a syphon barometer. Modelling. Carpentry or Sloyd.
(24) Drawing.	40	Not correlated this term

Free time reading.

4. By such means it is found that two chief ends are served. In the first place, interests are kept keenly alive, and the labour of learning is very much lightened by this very fact, as well as by the great economy of time thus secured; and in the second, the learner experiences for himself the real connection which exists between the different branches of his instruction, a connection which usually escapes him as completely as their relation to actual life. If a boy is intelligent enough to observe, he will notice that each of his masters is apt to complain of insufficient time allowed for "his subject," and a certain rivalry on this head; and if he is studious by nature, or should chance to be interested in any one section of his instruction, he will not attempt to serve two, still less many, masters, but will cleave to some one, and forsake the others as much as he dare. But by co-ordination much of this temptation may be removed, and time may be found for all the branches of a liberal education, and by such means the over-pressure in our schools may be permanently lightened. Permanently, because the scheme is based on the physiological condition that not more than about five hours severe mental exercise shall be demanded in each day.

A "Scheme" must be drawn up, because without it the rivalry of contending claims will lead to the same over-pressure which now exists. And the Term-book, developing the Scheme more or less after the fashion given in the preceding chapter, is also a necessity of the case, for without it teaching, though started under excellent theories, must become disconnected; and, as a matter of fact, teachers long accustomed to teach without reference to each other, and with the least possible reference to the Head, and to set tasks out of books, do, without its guidance, very soon slip back into the old ruts of purely formal and disconnected instruction.

It will be seen that the means we advocate involve the systematic overhauling of our system (or no-system)

of secondary teaching, and the substitution of definitely thought out Schemes of Instruction, with their developments, based on

(1) The purpose of the particular school;
(2) The natural laws of the mind which should govern the art of teaching (Sequence and Correlation);
(3) The age of entrance to, and leaving, the school.

In the last and the present chapters we have drawn up one out of many possible schemes, and given its development for the years from eight to twelve only. Under any systematic secondary teaching some such scheme would be drawn up by each school, and published for the guidance of parents and others. There is unlimited opportunity here for that independence of thought and action in which we rightly take pride as a national characteristic, but which is so generally wasted in mere personal rivalry. Those schemes which might have sufficient vitality would doubtless survive, and form a basis, now felt to be wanting, for systematic national instruction.

But there is a readier, an easier, and a better way than this mere unguided and unscientific *laissez faire* (which has produced the present conditions of overstrain), whereby results could be secured for the generation now coming to the front. This we shall endeavour to make clear in the next chapter.

Chapter VIII.

THE GREAT EXAMINATION QUESTION.

"A confessed failure "—Professor Mahaffy, *on Irish "Intermediate" Examinations.*

"Of all methods of selection the very worst is the counting up of marks at a literary examination."—Dr. Welldon.

1. The Growth of the Examination System. Not very long since the commissioned ranks of the Army and Navy and the chief places of the public services were filled by patronage. In the Universities alone examinations for degrees had for centuries been the gateways through which *Alma Mater* conducted her acknowledged disciples, without distinction of rank or wealth. As we all know, "The world went very well then"; the midshipman of twelve or thirteen, and the ensign but little older, learned, in the good old rough-and-ready days, enough of seamanship and war to carry them through a career in which those without interest scarcely aspired to rise above the first two or three steps at most. Those were the good old days of grey-headed lieutenants and grizzled captains of thirty years' service. Other professions were served by a system of articles, or apprenticeships, in the office or the counting-house—a training which naturally consisted more in the acquisition of the orthodox practice than of instruction in the principles from which that practice arose. An eminent medical authority told his hearers last year that, in his own student days, one of the lecturers at a large London hospital, commenting on the innovation of two microscopes in the wards, informed the students that "anything so small as to need a microscope to see it, must be of equally small importance."

All this has been changed. The great fact of this century, in whose last years we are living, is its Science. Greater and more imposing empires than those of our day have risen and fallen; greater literatures have preceded ours; greater artists have made their appeal; and it is in the past that Religions have arisen to sway the millions of mankind. But never before in all history have the processes of Nature been searched out with such care; never before has such exactitude been brought to bear on this research; never before have the experimental truths of the physicist been made the basis of philosophy, and applied in practical life, as they are applied to-day. Recognised principles, as distinct from routine experience, are proved and acknowledged to underlie the successful treatment of those forces which are the machinery of health, of construction, of manufacture, of commerce, and of war. As a natural consequence, the knowledge of those principles has been more and more forced upon those who are called on to direct these forces in their several fields, for this knowledge of effective proximate causes has become, and is daily becoming more and more, the first condition of success. To a less degree this knowledge is required by those who have to direct and legislate for these various activities, and hence it has come to pass that in all countries an immense demand has arisen for knowledge and training, as the preparation for success in that "struggle for existence," which, however it may be denounced and deplored, appears to be the moral plan on which the world is actually constructed, and certainly remains the dominant fact to which we must all conform ourselves.

The "success" may be of a high or a low order. It may mean greater knowledge of the Divine processes by which the Universe developes; greater effectiveness in the world; greater power of service of country and mankind; or it may mean more means of rational enjoyment: or,

again, heavier outputs, greater personal gain, more servants, larger houses, massive furniture, and all the many things wherewith we encumber our lives. But for any kind of success education is imperatively demanded; and whether with high or with grovelling ideals, all men are anxious to secure it for their children, in a world where the race is to the swift and the battle to the strong—if the strong and swift be not blunderers; and wherein we are not offered the choice between strength and honesty, between courage and weakness, but wherein each man receives in the long run, by the immutable laws of God interwoven in the very ground and nature of things, the due reward of his deeds.

We seek after knowledge as the means of wisdom, dumbly and blindly feeling with Plato that "the misery of man is to be baulked of the sight of essence and to be stuffed with conjectures, but the supreme good is Reality; and all virtue, all felicity, depend on this knowledge of the Real; for courage is nothing else than knowledge."

Political developments have worked towards the same end. The fall of the great system of class government, class legislation, and class exemptions, known in France as the "*old régime*," produced a wave of disturbance which spread over all Europe, and permanently modified our own institutions among many others. The durable work of the Revolution may be summed up in one of its own phrases "La carrière ouverte aux talents," and its results are seen in the general development of talent in answer to the new possibilities. This democratic principle compelled the imposition of tests, in lieu of the patronage on which even literary success once depended, and without which it is scarcely too much to say that no career could be made. From Columbus, beseeching from Henry of England and Ferdinand of Aragon the means to discover a new world, to Dr. Johnson, waiting in Lord Chesterfield's ante-room for a grant of money to publish his dictionary—architects, painters, men of letters, discoverers, soldiers, and

philosophers—all with but a few exceptions sought the patronage of the great and noble for their opportunities. Few but the Gentlemen Adventurers, who were the pioneers of English commerce and of the English flag, looked to their own combinations rather than to the gifts of noble patrons for the means of success.

The activity of private individuals, made possible by their growing productiveness and wealth, has replaced the whole system of patronage, whose poor little "jobs" now resemble the lost limbs hidden under the serpent's skin, mere anatomical vestiges of a once normal means of progression. Each man who enters the Services now expects to rise in them. Each man who enters a profession expects, or at least hopes, to rise to a director's position of one kind or another.

As a natural consequence, the Government, in the interests of the public well-being, or of the effectiveness of its servants, and the great Societies which watch over the Medical, the Legal, and the Engineering professions, have felt called upon to introduce tests of proficiency, and even in the former cases to make the permission to practise conditional on them. In the latter, the need for a guarantee of knowledge has within the last two years led the Institution of Civil Engineers to impose examinations as a preliminary to membership. The Board of Trade allows no officer to hold command without an examination and certificate, and punishes laxity or ignorance by its suspension; and even the Chambers of Commerce grant certificates of fitness by examination. In the Army, not only was it found necessary to abolish purchase and nomination, and to impose a severe entrance examination, but there are also examinations from grade to grade as well as for those opportunities of higher employment to which the Staff College is the gate. Even for Holy Orders the Bishops' examinations are, I am told, much stricter than they used to be; and only in the Teaching profession is there no test whatever of the ability

of the candidate to undertake his difficult and most responsible task, an exception which we may hope is now in a fair way to be removed.

With an extended system of primary education carried out by Government, and intended to provide a "ladder" (or a beanstalk) from the village school to the University* for such as can climb it, the natural and wholesome dread of untested results, and large payments without systematic checks, led to a double series of examinations—those instituted to prove the efficiency of the schools, and those in which the children competed for places, prizes, and scholarships. "Payment by results," the grant in aid for the coming year being dependent on an examination average, has happily been found out for a delusion, and is dead and buried; but a vast system of other examinations still dominates the education of the country; and the preparation of children for these, the close study of the kind of questions usually put, the giving of *memoria technica*, and the whole apparatus of cram, has become part of the pre-occupations of the teacher who aims at distinguishing himself by the number of his "passes." Not only so, but the Secondary schools, which had no real incentive to waste their pupils' time in wanton examinations, have followed suit. Oxford and Cambridge Local school examinations were instituted, and their lists are now published in the daily papers, and often added to prospectuses as a proof of the excellence of the tuition.

This would seem to have been done at first in schools of the second rank which were anxious to show results, and it is certain that a very large number of schools send up boys and girls for these examinations as a test of proficiency, and

* It is not quite obvious what is to be reached at the top of this beanstalk, except the admission of a proletariat of the pen to the Ogre's palace of Competition, so long as the degrees of the University are open to classicists only. If *Alma Mater* would recognise high excellence in any representative branches of knowledge as worthy of academical distinction, the boon might be a real one.

use their successes as a means of advertisement. The public, which never goes at all below the surface in matters educational—and, indeed, for the most part regards all these matters with deep dislike, and shelves them till growing children force them disagreeably to the front—is captivated by these paper successes, and even the great schools join in the game and show they can do as well as others in the competitive arena. Hence it has come to pass that, even in schools whose reputation and firmly-established basis might allow them to count in security on the distant, but certain, results of thorough training and sound education, the boys are frequently preparing for some examination or other, and the incentive to work is either a "pass" at some public examination, or a place in the term examination, or in the grand annual fortnight's Examination, which is provided, perhaps, lest the boys should be insufficiently examined. Even girls are plunged into the examination vortex, and schoolmistresses are encouraging them to read for degrees and certificates (which to many of them are not of the very smallest actual value), and cram instead of training, with the results of even more frequent headache, anæmia, and functional disturbance than is the case with boys.

This in its completeness is the Examination system. It has not been invented; it has grown out of a real need, though the end it serves has been obscured, and it has been exaggerated into an evil. School inspection by independent educational authorities will, indeed, displace much internal examining, but can never be made the basis of decision between competing candidates for an exterior post. For this decision some kind of examination of the pupils is necessary, whether oral or written; and there is a general public feeling, very strong among candidates, that the written exam. is the only means by which masses of candidates can be fairly and evenly dealt with, given time to collect their thoughts, and to express themselves at their best. Oral examinations may usefully supplement the papers, but mere considerations of

time and human fallibility will always forbid the supplanting of the former by the latter. Certificates of good progress at recognised schools have been proposed as another alternative, and that permissions should be given to the headmasters to nominate for the Services; but the objections are so great to the enormous patronage which would thus be thrown into the hands of all such schools, that the lesser evils and personal risks of such a measure need scarcely be mentioned. Such a retrograde step would institute a gigantic monopoly—for if the number of such schools were large, the present difficulty would be untouched,—and a monopoly must work, as all monopolies do, towards a lowering of effectiveness. Instruction would probably be limited to that antiquated curriculum of Greek, Latin, and elementary Mathematics which is still favoured by headmasters who live by them, but certainly does not make for directive ability, and whose ineffectiveness has led to the technical Examinations. And if these certificates were granted on the German plan of the Abiturienten examination, then clearly only the name and locality would be changed, while a further test between competing numbers would still be necessary. We must therefore, however reluctantly, conclude that Examinations are a necessity of the case, and seek some other means of dealing with their acknowledged evils than the drastic and arbitrary measure of their abolition.

2. Formal and Scholarly Examinations: their Results. As examinations became necessary, it was natural that they should be conducted by University graduates, who are deservedly regarded as specialists in knowledge; and equally naturally the form of such examinations came to be scholarly, and modelled on the University examinations for degrees. The University graduate, well aware that only that knowledge which has passed through both the Empirical or particular, and the Formal or generalized, stage can

properly be called complete; and being himself the scholarly product of a system of instruction suited to his mental type, naturally imposes tests similar in kind to those he has himself undergone, and inevitably judges according to the standard with which he is familiar. Such examiners, the *élite* of a scholarly system, necessarily, unless they be also trained teachers, impose scholarly tests. Hence arise three classes of questions, equally unsuitable to the immature minds of schoolboys :—

(*a*) Those which require for a good answer a mature judgment, or tolerably ripe scholarship, or both ;

(*b*) Those which turn on tricks of manipulation familiar to specialists, but extremely puzzling to juniors who have only a sound working knowledge ; and

(*c*) Those which test memory to the (possible) exclusion of understanding.

As examples of the first class may be quoted the following, taken at random from papers set to lads of seventeen or so, going up for the Army, in 1895 and 1896 :—

In a Latin paper. Translate into Latin elegiac verse—

"As o'er the deep the seaman roves,
With cloud and storm above him,
Far, far from all the smiles he loves
And all the hearts which love him ;
'Tis sweet to find some friendly mast
O'er that same ocean sailing,
And listen in the hollow blast
To hear the pilot's hailing.

"On rolls the sea, and brief the bliss,
And farewell follows greeting :
On rolls the sea, one hour is his
For parting and for meeting.
And who shall tell on sea or shore,
In sorrow or in laughter,
If he shall see that vessel more,
Or hear that voice hereafter ?"

In History papers—

"Give an account of the constitution and powers of the Court of Star

Chamber under Henry VII., comparing them with those existing in the reign of Charles I."

"'Great as Pitt's abilities were, his military administration was that of a driveller.' Does the history of the Revolutionary War justify this criticism of Macaulay's?"

In a Greek paper—

"What is meant by the Homeric question? Discuss any solution of it which you know." *

Write an essay on—

"What can they know of England who only England know?"

How can any boys give more than the most meagre and second-hand answers to such questions? Does not this kind of thing induce that most pernicious habit of using words to cover ignorance? Examples could be multiplied indefinitely of questions for a ripe scholar set to lads who cannot distinguish with certainty between Mary Stuart and Mary Tudor, and who are absolutely innocent of any conception of national historical types, or the very meaning of constitutional history.

Of questions of the second kind, examples may also be taken *ad infinitum* from the mathematical papers wherein wranglers and mathematical specialists examine in their speciality. I quote from the same papers :—

"If T is the periodic time of a particle revolving uniformly in a circle of radius r, show that the acceleration of the particle directed towards the centre is $\frac{4\pi^2}{T^2} r$.

"During any year the excess of births over deaths causes an increase of h per cent. of the population, and at the end of the year a fixed number A of the people emigrate. Prove that at the end of n years a population becomes

$$b^n P - \frac{b^n - 1}{b - 1} A.$$

where $b = 1 + \frac{h}{100}$

* *Query.*—As one boy explained : That "the *Iliad* was not written by Homer, but by another man of the same name."

10. Prove that the coefficient of x^p in the expansion of $(1-x)^{-(n+1)}$ by the Binomial Theorem is equal to the coefficient of x^n in the expansion of $(1-x)^{-(p+1)}$, both expansions being in ascending powers of x.

Hence (or otherwise) find the sum of the first twelve coefficients in the expansion of $(1-x)^{-5}$ in ascending powers of x by the Binomial Theorem.

And these are questions set to boys, many of whom could not say what would be the relative distances to which two balls, of 2 lbs. and 4 lbs. weight respectively, would travel under equal impulses; and are unaware in what units any given algebraical magnitude can be expressed, or what the sign of equality really means.

Tests of mere memory are equally abundant.

"Describe, giving all the necessary technical terms, the procedure in a Roman Court of Law at the time of Cicero."

"How far are the letters Y, Z, and K used in Classical Latin? Explain the origin of the numerical symbols L, M, D, X, and the abbreviations A.V.C., C., M'., S.D.P."

"Draw a sketch map of S. America north of the River Amazon. Mark the eight different political divisions, and a chief town in each; trace the courses of the rivers Amazon, Orinoco, Rio Negro, Magdalena, Casiquiare, Essequibo; Lake Maracaybo, the island of Trinidad, Chimborazo, Punta Gallinas."

These are fair samples of the bulk of Army papers, from two years only, taken quite at random. And these, be it remembered, are types of what these lads are expected (?) to know in at least five or six different "subjects," and set to boys who are unaware what is the difference between the County Court and the Police Court of their own land, and could not draw a sketch map of the square mile which surrounds their own home to save their lives. On their answers to these and scores of other more or less abstruse questions depend their whole future career. At the same time, all direct test of their working knowledge of the meaning of the words and symbols they use is omitted. Mathematical symbols are the means of expression for formal and abstract knowledge, and this formal and abstract

knowledge *may* be based on particular and concrete knowledge, and in the mind of the examiner it is of course so based, but not necessarily in that of the examinee. A boy may be able to write out a proposition of Euclid because he understands geometry—but he may also depend upon little else than memory; and many boys do thus "learn" their Euclid, and even get up their algebra and conics on the same mechanical plan, without any reasoned knowledge of the formulæ they use. From the grave omission of all test of a candidate's common-sense grasp of principles, a sound psychology, or at any rate a science of teaching based on its natural laws, might have saved our examiners; but, unfortunately, even our Universities have not till very lately taken any note whatever of the existence of experimental psychology, and the vital importance of its laws in their practical bearing on teaching.

Thus it has come to pass that our examinations have become over-severe tests of formal knowledge, literary exercises dealing largely with words, too careless what are a lad's real conceptions underlying these words. They defeat their own purpose as tests of sound knowledge. We are indeed at the present time in the full swing of a vicious circle: the examiners setting formal papers because the school instruction is formal; and the school instruction preparing for a high formal and literary standard at the examinations, although able teachers consider such literary examinations "the worst of all possible tests of fitness." But it is a demonstrated fact that the stage of mental growth at which Formal knowledge can be assimilated is not reached by the majority of boys till about their fourteenth or fifteenth year, and cannot be, because it depends on collected experiences as well as on brain growth; and hence it has come to be accepted that up to that time they will not learn much of anything, and that "work" is synonymous with overstrain.

Under the same system of Formal examinations the whole

Irish Intermediate Examinations, under which hundreds of thousands of pounds have been awarded in scholarships, has become "a confessed failure." The witnesses before the Commission state that "young men with a fair classical and literary education are a drug in the market." We are manufacturing "Chinese *literati.*" The examinations are so purely Formal that candidates may pass in Music without being able to distinguish '*The Wearin' o' the Green*' from the '*Boyne Water*,' as Professor Mahaffy wittily puts the fact in the *Nineteenth Century Magazine* for last November; and in Botany, without knowing anything of the living plant. The whole system is "a delusion," and makes an unpractical and discontented proletariat of the pen.

Under this system the Rev. Dr. James, head-master of Rugby, stated as a well-known fact, at a recent Conference of Head-masters (Dec. 1897), that "a boy who became a candidate for Woolwich or Sandhurst had to say good-bye to literature, and to all study of the history of the past or the politics of the present. He could not read a French, German, or Latin author intelligently."*

The results of this system are matter for constantly recurring complaints in the press, which, curiously enough, do not seem to end in any action, but only in complaining, perhaps because those complain who have felt the full stroke of the developed evil, and for whose children "education" is over; while those whose turn is yet to come are not sufficiently aware of facts to take measures in time.

These complaints are, however, very definite, as well as regularly recurrent. In August, 1895, Mr. F. W. Caulfield, B.A., an Oxford scholar and an Exhibitioner of Rugby School, summed up, in *The New Review*, the case for more skilful instruction in our schools as follows :—

* As a remedy, Dr. James would "diminish the number of subjects by at least one, and that a heavy one," (*i.e.*, would lower the standard), but would retain the Latin, on which our mediæval system of instruction is still built, and, therefore, make the examination still more literary than it is.

"The normal career of a boy of the well-to-do classes may be taken as somewhat of the following kind :—Up to the time of going to school he has shown more or less interest in the conversation of his home, and can speak intelligently on ordinary topics ; he may even take some pleasure in the subjects of his lessons, and try to puzzle out for himself something he does not understand ; he may, perhaps, amuse himself by collecting butterflies or trying to make a steam-engine ; his writing is legible, and possibly he may be able to understand and speak a little French or some other modern language.

"Six months at school and all is changed ; the mill of school work has ground him into a dullard. He takes no interest in higher questions than whether Smith is a better bat than Jones, or Jenkins a greater beast than Jorkins ; his writing is execrable, and his French has disappeared ; having no resources, he suffers from *ennui*, and is incapable of amusing himself for an hour without a novel ; his lessons have become a mere performance necessary to be got through in order to escape punishment or to secure marks ; he has no care to understand what they are about, and if anyone should be superfluous enough to offer to explain a difficulty, he will answer that he has so many lines to get ready by next lesson and has not the time to spare.

"At the age of sixteen or seventeen it is necessary to take stock of the gains or losses of the past seven years, two or three of which may be supposed to have been passed at a Preparatory School, and the rest at a large Public School. A young fellow will probably be found active and athletic, able to play cricket or football, to obey or command, and to hold his own with his equals ; he has also acquired a well-bred, unaffected manner ; all of which will serve him in good stead in after life.

"But what is his record in intellectual matters ? He will be able not exactly to read, but to make out the sense of a Latin or Greek author with tolerable ease by the help of a dictionary, and to write tolerable Latin or Greek prose or verse by the same help ; he has a fair grammatical knowledge of French or German, which, however, he is unable either to speak or to understand when spoken ; he knows a little Mathematics, and less or no Science : if he wishes to enter any profession by competitive examination, he must seek the aid of a crammer to make up for lost time.*

"Six or seven hours a day, six days a week, more than eight months in the year, for seven years. *Ten thousand hours* spent by picked men teaching picked boys, and this is the result !"

Not only does the average boy learn deplorably little,

*Since this was written I understand that considerable progress has been made at Public Schools in preparing boys for Sandhurst, Woolwich, and the *Britannia*, but at the cost of lengthening the already excessive time-table.

but he works too long hours. Mr. Caulfield gives the Upper School time-table of one of our great Public Schools as below :—

7·0 — 8·0	A.M.	First school.
Service in Chapel.		
9·15—10·45	A.M.	Second school.
11·0 —12·30	P.M.	Third school.
12·30— 1·15	,,	Extra lessons.
4·15— 5·10	,,	Fourth school.
5·15— 6·15	,,	Fifth school.

Between 7 and 10 Preparation, with half an hour's interval for Chapel.

This time-table works out to some seven hours a day, after making allowances for half-holidays and for the actual time spent in preparation being less than the nominal time; though this

> "takes no account of impositions or of any work undertaken voluntarily, such as competition for a prize, preparation for some special examination, learning music, and so forth.
>
> "This alone would account for the fact that a considerable percentage of the boys in the upper forms of our Public Schools have not the robust appearance which they ought to have. Coming from a healthy class of society, well fed, living under sanitary arrangements generally perfected with great care, yet a considerable proportion of them look pale, strained, and haggard. Many have not the cheerfulness and elasticity of spirits proper to their age, and not unfrequently one breaks down from overwork—all indications that their reserve of vital energy has been unduly drawn upon ; that they will have less power to endure work or withstand disease, less courage and vigour of action, less brain force than they might have had if some of their constitutional strength had not been wasted."

The nervous energy, in fact, has been misdirected, and more or less pronounced overstrain is the result. Well may Sir James Crichton Browne say :—

> "Mr. Caulfield has, it seems to me, hit upon two grave defects in our Public School education at the present day—inadequate methods of teaching, and excessive duration of brain labour—resulting in performances miserably poor in proportion to the time and energy employed in preparation, and in some impairment of constitutional vigour, with other more remote and less ostensible evils."

The article continues :—

"But it will be said a boy does not really work all this time. True, he does not, and cannot, and that is just the mischief of it. He is overwhelmed with too much work, and therefore he scamps it. He thus acquires a slovenly and superficial habit of mind. He never masters the first principles of any subject, and his progress is always hampered in consequence. He cannot afford the time or energy to think, and so becomes by degrees less capable of thinking. The alternative then is, that those boys who attempt the impossible task of doing thoroughly all the work set them, suffer in constitution ; those who scamp their work suffer intellectually. Perhaps the majority manage to combine both evils, and, while suffering somewhat in health and vigour from long poring over books, are damaged intellectually as well.

"It is urged in defence of these long hours, and consequent excessive amount of work :—

"1. That they are needed to keep boys out of mischief.

"2. That as boys are certain to be idle a proportion of their time, they will not do a proper amount of work unless the appointed hours are in excess of what is really necessary.

"3. That long hours are unavoidable ; a certain quantity of matter has to be got up for competitive examinations, and it cannot be done otherwise.

"The first difficulty has been solved in the case of Elementary Schools by interspersing the purely intellectual work with such employment as singing, drawing, carpentry, drill, &c. ; and it ought not to be beyond the power of a capable head-master, with the greater opportunities and appliances of a Public School, to provide sufficient interests for the boys under his care ; and indeed some have already taken a praiseworthy lead in this matter.

"The second objection means simply that boys have got into a vicious habit of discounting their work, and to attempt to cure this by detaining them for long hours over tasks which they are not expected to take seriously, is like trying to cure a person of unpunctuality by keeping the clock ten minutes too fast. The right course is to appoint them such an amount of work as is reasonably within their powers, and to insist that it shall be done ; and boys are as quick as other people to understand what orders are *bona fide* and what are not.

"The third objection is a more serious one ; but taking competitive examinations as a necessary evil, it is probable that, even for the purpose of passing these examinations, hours of work so limited and arranged that pupils may preserve the maximum of brain energy both in their daily training and also in the examination itself, are likely to be far more effectual than an excessive amount of time spent with the intellectual powers in a wearied and languid state. When the brain is fresh and vigorous, intellectual progress, whether in the direction of acquiring knowledge or of cultivating the mental faculties, is made with the least

effort; as fatigue increases, so does the effort necessary for a given amount of progress increase, till a point is reached at which the proportion of progress to effort is so small that further work is mere waste. That point is certainly passed in the last hours of a "whole-school-day," when jaded masters try to make jaded boys keep up a pretence of being occupied by something else than dozing or writing notes to one another, but before that point is reached a great deal of time is not employed to good advantage. Fewer hours of more vigorous effort would store the memory with a greater amount of information, and that more deeply impressed, while into the bargain the quality of the work would be incomparably superior; for with a margin of time available in which to put the screw upon idle or careless boys, it would be possible to insist that rudiments should be thoroughly mastered, and everything done with precision, and in the best style.

"This, surely, is correct theory, but it is not mere theory: a case has come under my own observation of a boy of ordinary abilities who passed the entrance examination for the Royal Navy above the middle of the successful candidates, and whose preparation had been three-and-a-half hours' work per day, everything included."

But the old inefficient system holds its ground, and when an examination looms near, the services of the "crammer" are called for to get into twelve, or even into six months, the information which should have been acquired in the previous nine years. This much maligned gentleman is, it is true, compelled for obvious reasons to study "likely questions" and examination "tips," and confine himself to the immediate purpose, neglecting much which he knows to be essential to sound knowledge; but he does for the most part—I speak from considerable experience—base his teaching on understanding and not upon memory, and this should acquit him of the charge of "cramming," which, whether given at school or at the establishment of an Army coach, is the reverse process of founding instruction on memory rather than on understanding. He is, it is true, called upon to impart the maximum of knowledge in the minimum of time, and therefore to work his lads ten or more hours a day (I know cases of twelve and thirteen hours), leading to more overstrain, and to loud and deep denunciations by parents, paying at the rate of £250 or £300 a year, of the "system of competitive examinations,"

which, it is supposed, compels such expensive and exhausting brain-work.

The end of this kind of training is what might be expected. (1) Many boys from quite early school days come to regard all knowledge, not as valuable or interesting in itself, but as good to pass an examination with: boys themselves have avowed this to me quite naïvely. (2) The examination once over, they dismiss at once and of set purpose* all that has so laboriously been acquired, nor indeed could they retain it if they wished, for extract of knowledge cannot be assimilated nor remembered for more than a short time. (3) Many have acquired for life the regular habit of severing the word from the thing, and of looking on all knowledge as bookish and unreal.

The professions are flooded with young men of this type. Medical authorities complain publicly† that the numbers of those who dissect and study *things* is dwindling to a minimum, the large majority of students preferring to get up their anatomy out of books and diagrams. "The anatomy of the eyes, tongue, larynx, liver, &c., is taught by a system of chalks, blackboard, and tutorial cramming classes." This is cram, memorizing of words and diagrams apart from realities, and of it Dr. Thos. Cooke, F.R.C.S., says: "This cram system is demoralizing the schools, discrediting the examining bodies, and dishonouring the profession." The Address from the medical chair at University College, London, in 1897, emphasized the same thing:—

> "The student may know in order every branch of nerve, and be able to draw the brachial plexus on the blackboard with his eyes shut, and

* "What is the use," said an intelligent boy of sixteen to me, "of trying to remember all the stuff we have to learn? No one uses Euclid to get his living by—nor Latin and Greek either, unless he is a mere schoolmaster." There is more than one inference to be drawn from this pregnant sentence, from the notion of learning as synonymous with remembering, to the contempt implied in the last adjective for those who have no experience of the needs of active life.

† *Lancet*, Jan. 20, 1894; Feb. 6, 1897; Oct. 9, 1897.

yet fail to recognise them in their to-him-unfamiliar place, the body. 'Who,' he asked, 'is not familiar with the would-be anatomist with diagrams, mnemonics, and illustrations cramming up other people's dissections?' "

The sum and substance of the complaint is that the formal knowledge of words is made to do duty for the real knowledge of things, and mere sounds for sense concepts. How absolutely this is the case may be illustrated from some actual "howlers" given in the *Lancet*. "Hydrogen gass (*sic*) is degenerated from the urea." "Cantharides is derived from the root of the plant." "Spartein is derived from Sparta." "The function of the optic nerve is to contract the pupil and move the eyeball," &c. &c. These, it will be replied, are the answers of the hopeless "duffers." They may be, but these hopeless ones have produced proofs of a "liberal education" before entering on their medical course.

The same kind of complaint is heard from quite different quarters. Two late Professors of Woolwich Military Academy spoke to me personally of the extreme difficulty of teaching some of those who have passed the several formal examinations mentioned above. Not only, it appears, do they fling off, perhaps in self-defence, the burden of knowledge acquired, but there is among them a number who have become so accustomed to memorize that one of these gentlemen said to me of such lads, "They know nothing, they understand nothing, they can only remember, and if their memory fails they cannot recover the simplest formula by going to the principles."

Another Staff Officer spoke to the same effect, of others who seem in later life quite unable to make the common-sense application of knowledge which scientific soldiering demands, but will seek and rummage in the chambers of memory for a method or formula, owing to the same habit of attempting to remember the words of the book.

I have myself examined engineering students who, on being asked to describe in writing the essential parts of the prismatic compass they had used for months, attempted to

give a definition of it out of a Manual of Surveying instead of from their own experience, forgot what they were describing, and wrote a description of quite another instrument; eighty-six per cent. of papers written by these young men of 18 to 21 showed the same ignorance of the obvious commonsense reply to plain and easy questions, and the same tendency to serve up information out of the text-book, mostly irrelevant to the question asked. On this point one is not at liberty to mention a tithe of the cases which come under notice.

The following are some published answers by unsuccessful candidates to papers set for the entrance examination to a well-known Engineering College, whose students are mostly the sons of parents able to pay some £200 a year for their tuition, the product of the great class-schools of England, who presumably paid their examination fees under the impression that they had a chance of passing :—

1.—The Atbara is in the Crimea.

2.—The Philippine Islands belong to England.

3.—(*i.*) Rangoon is the Chief Island of the Philippines.
(*ii.*) Rangoon is the corner of Asia Minor, at which Cyprus seems to be pointing.

4.—(*i.*) The Yukon is one of the Japanese Islands, noted for inlaid goods.
(*ii.*) The Yukon is a river in China. A battle took place here during the late war between China and Japan.

HISTORICAL.

1.—(*i.*) Galileo was the famous painter of Venice.
(*ii.*) Galileo was one of the chief Roman Catholic conspirators in Elizabeth's reign, and tried to assassinate her.

2.—Philip Augustus was Pope of Rome, who tried to teach the early Britains Christianity.

3.—General Wolfe was Commander of the United States Army during the Confederate War.

4.—(*i.*) Sir George Rooke was the Commander of the St. George when she went down.
(*ii.*) Sir George Rooke conquered Hong Kong.

5.—"Westward Ho" was written by Dickens.
"Idylls of the King" were written by Sheridan.
"Utopia" was written by Thomas Cranmer.
"Don Quixote" was written by Dean Swift.
"Don Quixote" was written by George Eliot.
"Don Quixote" was written by Byron.

I will only add that an entirely delusive colour is thrown on the marks gained by candidates at certain examinations, by the practice of adding such a percentage to those of the first passman as will raise his total to full, or nearly full, marks; and *pro rata* to those below him. This involves no injustice, but it obscures the standard to the public. I know of cases in which the marks shown opposite a candidate's name were 60 per cent. earned and 40 per cent. thus "assigned."

These facts point to a large percentage of inefficients in the battle of life, and "public school failures," and co-exist with a quite appalling amount of overstrain among the successful, and even among the unsuccessful. To this pass have we been brought by the examination Frankenstein which our teachers have created: that this monster threatens us with fluent inefficiency at the expense alike of bodily health and of genuine knowledge.

3. Examination Reform: Its Principle and Method. Existing examinations are of two kinds:—

(*a*) They are tests of general education; or,

(*b*) Tests of professional knowledge.

To the former class belong the Examinations to the Indian Civil Service, to the Army and Navy, to the Indian and Colonial appointments, the Home Civil Service, and "Entrance" examinations generally.

To the latter belong all professional examinations which test specialized knowledge, whereby advancement from grade to grade is earned, or academical and professional degrees are conferred;* and these are necessarily Formal, whereas the former are not.

* The University courses are, in the modern world, as much specializations in culture and scholarly erudition, as the courses at Guy's Hospital or Cooper's Hill College are specializations in Medical and Engineering knowledge. That this is not generally recognised, but that these courses are considered part of a general education because dealing with knowledges which have been selected to give this, is one reason for the confusion of mind that causes so many schools to train so largely on the presumption of a University stage to follow, and therefore to lay such stress on Latin, to which a majority of boys devote the greater part of the best years of their school life.

The Government and the professional bodies rightly insist on a certain standard of general education, because special knowledge is built up out of general knowledge, whose formed concepts are its raw material. Full advantage can be taken of special training only by minds which have been accustomed to observe, to weigh, to compare, and to reason; and have, moreover, certain formed concepts and mental habits, known as mathematical, physical, or historical knowledge, and linguistic style. The young medical man can have no sound knowledge of physiology without familiarity with the chemical and mechanical forces, which, as a matter of fact, govern the working of the body: the combatant officer cannot make a sketch, find ranges, or understand fortification, without an abundant stock of mathematical concepts.* Engineering operations, more than those of any other profession, involve the same concepts, for they deal entirely with forces and magnitudes. And all who direct or advise others require that culture which gives a sense of proportion among life's difficulties, which accustoms to reflection, and therefore tends to sympathy and justice, as well as to that tact, ability to obey, to direct, and to advise, which results from training and discipline more than even from Humanist instruction, though hardly to be gained without it. Hence professional knowledge is always formal knowledge, complete as far as it goes; and the professional examinations must be chiefly formal also, examiners taking for granted the concepts of general instruction, which are its raw material.

* Do those who have read "*A Fleet in Being*" realize how completely the old hammer-and-tongs fighting has passed away, and how completely mathematical and physical ideas must have become part of the mind itself before the young officers can, at a moment's notice, seize on the essential point in some disaster to the delicate mechanism he is called on to control? Modern successes in all professions turn largely on such assimilated knowledge. A regular course of training on the *Britannia*, from fourteen years old, gives it to the Navy; and here may be seen the result of modern system compared with the go-as-you-please instruction, according to tradition, slightly modified by the personality of the head-master, at so many of our schools ashore.

But tests of the preliminary general education, which alone is under consideration here, have a quite different function to fulfil. Their chief object is to discover whether these concepts exist in the minds of those examined; whether, in fact, their knowledge has passed through the first elementary, empirical, and concrete stage, to the formal, generalized, and abstract stage, which latter implies also a certain power of expression.

An examination, then, which is to distinguish between the fruit of the tree itself and the gauds hung on it, must test knowledge of principles in their practical application, as well as completed formal knowledge. And it must test this with special reference to the age of the candidates. At present the examinations not only devote themselves chiefly to formal literary and mathematical knowledge, but are far above the normal attainments of the examinees. The result is that schools train to meet these conditions, and look to "high" attainments. Many questions are set far above the level which can be reached by the average boy of good parts under a sound and well-balanced system of instruction, and examiners discriminate between candidates according to (*e.g.*) the more or less advanced Mathematics, in which they can solve formal problems; therefore boys take up analytical geometry before they have a really sound knowledge and working facility with Euclidean ideas; and attempt to read philosophical authors before they can adequately deal with simple narrative. Hence comes a perpetual race for higher and higher results, and all the *catena* of evils which are summed up in the words educational Over-pressure. The analogy between mental and bodily growth is complete. Functional development depends on functional activity, which, so far as it tends to development, we may call exercise.

"Beyond that point it becomes STRAIN, and injurious to health. *Duly regu'ated* exercise is essential to the proper development of every part of the organism, and the ultimate attainable strength of each, in relation to organic structure, is determined by the extent to which it is thus

exercised during the whole period of youth. Any part which receives no exercise (as is often the case with the muscles of the scalp and ears) is altogether lost as regards functional power, and all deficiency of exercise entails a corresponding defect in the strength of the part concerned. On the other hand, *excessive exercise will produce excessive development at the expense of growth, with present increase of functional power, but ultimate organic weakness.** This is seen where, as in mining districts, boys are put to hard labour. As boys these are abnormally strong, and have the appearance rather of little men. Nature, as it were, finding the strain upon the organism incompatible with the continuance at the same time of growth and health, chooses to sacrifice the former so as to save the latter. She thus hurriedly winds up her unfinished work, and adapts the young organism, as best she may, to the adult conditions imposed upon it. In such districts the men are found to be of small stature, poor physique, and short-lived. What is thus demonstrated in the case of the body is equally true of the brain and mind. Any part of the mind (and there are many parts) which is insufficiently exercised in youth must be correspondingly weak in after life ; while any part which is exercised to excess will be abnormally strong at the time, at the expense of growth and organic stability of the part of the brain from which it is evolved, with ultimate weakness and a tendency to early decay. It is difficult here to illustrate the effect of insufficient exercise, as such defects as would result are usually set down to individual peculiarity ; but with all respect to the teaching profession, I would suggest that the restricted range of mental exercise prescribed by the school, and the comparatively little time or opportunity allowed for any other, must have the effect of narrowing the scope of mental development. The premature development consequent upon excessive mental exercise is witnessed in those young persons who work hard for school prizes and competitive examinations. They want the brightness and animation of youth, and have an abnormally thoughtful, careworn expression of countenance,—are, in short, mentally, *little men and women.* It would not be difficult to instance numerous examples of the further analogy of later years, when the mind breaks down more or less on the very threshold of its life's work, and is worn out when it ought to be at its strongest. Such cases are probably within the experience of all medical men. They are freely cited by most with whom I have had occasion to converse on the subject, more especially in reference to the Indian Civil Service examinations. These are designed to test, not qualification for the work in prospect, but simply the powers of endurance of the candidates. They are no doubt a means of selecting those who are strongest at the time, many of the weaker breaking down under the strain of preparation ; but they are also a means, according to inexorable physiological law, of preventing them from being strong in the future.

* These *italics* are ours.

> "For the attainment of full power of any part, physical growth and functional development must go hand in hand, each, as it were, waiting upon the other. Exercise, while full, must use up no more than its share of plasma, *leaving the due quantum to be vested in growth for adult use.* To whatever extent this correlation of activities is departed from, so far will ultimate power come short of what it might have been." *

Here is the summary of the problem of overstrain in education, and a statement of the exact seat of the evil, and here it is that the remedy must be applied. To meet the conditions which have created it the guiding principle is, that discrimination between candidates should be made not according to mental precocity, but according to thoroughness, style, and *power of applying abstract knowledge suitable to the age of the examinees.* Examinations should test (1) the ideas or concepts the candidate possesses in the branches of knowledge which he offers, and (2) his formal progress in these branches, *no questions being set above the standard decided on as suitable to the age.*

Rational examinations, in fact, should be the correlatives of rational Schemes of Instruction, laid down in full view of the conditions for each school, or at least for each kind of school, by teachers trained in the Science of Education and the Art of Teaching, and planned to lead through the particular and concrete to the general and abstract. This would deal the death-blow to "cram," and with it to a vast amount of educational overstrain; for success in examinations would not, as now, be to the teacher who can get a boy of sixteen to know, at least for a time, as much as or more than he ought to know by eighteen, but to him who taught most thoroughly the subject matter up to the standard of the age.

Such school courses would be:—(1) Balanced, having due place given to Humanist, Realist, and Manual Instruc-

* Dr. J. Strachan, M.D., Physiology of Education. *Parents' Review*, January, 1899.

tion, in each of which there is so large a choice; (2) adapted in each stage to the normal age of the children; (3) arranged in a definite sequence to lead up to the kind of life for which the school is preparing; (4) correlated to the other studies; and (5) would be based upon the time available between the normal age of entering and leaving. It will not suffice for even an ideal Committee to go through the list of branches of instruction which the various examining bodies use as a means of testing general education, and to draw up a detailed syllabus of instruction for each. Not long since a pamphlet was issued by the Incorporated Association of Head-masters, giving the views of a very strong Committee * on Elementary Science Teaching. This admirable and helpful summary of instruction gives, for elementary and original (heuristic) work in Physics and Chemistry, precisely the kind of live syllabus which is so urgently required. But it would not be possible to extend this plan to the whole of the secondary course, because the time to be given to each branch of instruction could not be specified. Even the usefulness of this excellent little publication is impaired by the same fact: no time being specified, some teachers conceive that it can be adequately carried out in a course of two hours a week for two terms, while others find two years insufficient to deal with it thoroughly, even when the portions which properly deal with Mechanics are made over to the Mathematical master. If the same kind of syllabus were drawn up for all the branches of instruction in a secondary course, many would overlap, the difficulty of finding time for all would be accentuated, and the additional thoroughness, coming after the usual waste of the early years, would very greatly increase the present disastrous over-pressure.

* Mr. C. M. Stuart, Catford, *Chairman.*
Professor Armstrong, Kensington.
Mr. Bird, Rochester.
Dr. Draper, Merton.
Mr. Sanderson, Oundle.
Mr. Wells, Battersea.
Mr. Wertheimer, Bristol.

The one thing needful is the systematization of our secondary curricula by such competent authority as would command respect—Schemes of Instruction drawn up on Classical, "modern," English, or any other lines, which may be decided by competent authority, after full discussion, to meet the needs of the day. Not that such authority need be exercised in direct control of the schools—from such a task even an administrative Briareus might well recoil—nor that Standards such as those laid down for the Board Schools should be worked out for secondary schools; but simply that complete Schemes of Instruction should, after full discussion, be framed to meet the present needs of each type of school, by competent authorities either in the Educational Department, in the Universities, or as a strong mixed Committee; and that syllabuses based on these schemes should be worked out after the elastic manner of the syllabus of elementary science teaching above quoted, balanced and correlated as we have endeavoured to do in the foregoing pages. Table I. and the accompanying scheme, which we offer as typical for a frankly modern course of instruction, in which the full weight is given to Humanities without the handicap of a complex language, are two examples of the kind of schemes proposed. Not more than twelve such Schemes of Instruction would probably be required to cover the needs of the classical, classico-modern, modern, commercial, higher-grade, and other kinds of school which aim at giving "a liberal education," or "a sound general education," according to any recognised formula. All possible elasticity and free scope for individual choice might be secured by selecting for these schemes three or four literary branches, certain departments of Mathematics and Science, all suitable to a liberal education, and each in its own class equipollent in the public examinations, leaving schoolmasters free to choose among them on the basis of a scheme of work providing for, say, eight or nine branches of instruction. This principle of restriction of "subjects,"

SCHEME OF INSTRUCTION.—TABLE II.

EXPLANATION.—The **leaded type numerals** denote the successive School Terms from the age of 8 to 18 years. The **vertical columns** contain the number of Lessons devoted to each branch of instruction in each Term of 13 weeks, here conventionally taken as 10 weeks, to allow for Repetition, Examinations, Variation of Course, &c., &c. Hence the number of "Lessons per Term," in the last line ÷ 10 gives the number of Lessons per week—*e.g.*, Arithmetic 60 stands for 60 Lessons in the Term, or 6 in the week, 1 daily. The **last column** gives the total time devoted to any given branch of study in the entire Course; and the **Analysis**, the time devoted to Humanist, Realist, and other groups in each period respectively. The Lesson-periods between the ages of 12—15 and 15—18 are marked "Provisional," because the allotment of time for the average boy has not been sufficiently proved, and because there should be a choice of instruction exercised at 15 years of age, according to a boy's proved aptitudes. This part of the table is given only to show the general sequence.

	Subject Matter.	Normal Age, 9th to 12th Year (Inclusive). Lessons ¾ Hour each.												Normal Age, 13th to 15th Year (Inclusive). Lessons partly 1 Hour each.									Normal Age, 16th to 18th Year (Inclusive). Lessons chiefly 1 Hour each.									Total Lessons to each branch.
	TERM	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	XXI.	XXII.	XXIII.	XXIV.	XXV.	XXVI.	XXVII.	XXVIII.	XXIX.	XXX.	
	Humanist.																															
1	English Comp. and Grammar	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	600
2	General History (specially of Britain in later years) ...	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	900
3	English Literature	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	30	30	30	30	30	30	30	30	270
4	French	90	90	90	90	90	90	90	90	60	20	20	20	20	20	20	20	20	20	20	20	20	10	10	10	20	20	20	20	20	20	1,170
5	French History...	—	—	—	—	—	—	—	—	—	10	10	10	20	20	20	20	20	20	20	20	20	—	—	—	—	—	—	—	—	—	210
6	French Literature	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	20	20	20	20	20	20	20	20	180
7	German	—	—	—	—	—	—	—	—	—	90	90	90	60	60	60	60	60	60	30	30	30	30	30	30	30	30	30	30	30	30	990
8	German History	—	—	—	—	—	—	—	—	—	—	—	—	20	20	20	20	20	20	20	20	20	—	—	—	—	—	—	—	—	—	180
9	German Literature	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	30	30	30	30	30	30	30	30	270
														In German																		
	Mathematics.																															
10	Arithmetic	60	60	60	60	60	60	60	60	30	30	30	30	20	20	20	20	20	20	—	—	—	—	—	—	—	—	—	—	—	—	720
11	Geometry	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	—	—	—	—	—	—	—	—	—	420
12	Algebra	—	—	—	—	—	—	—	—	60	40	40	40	40	40	40	30	30	30	40	40	40	40	40	40	40	40	40	40	40	40	870
13	Mechanics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	420
14	Trigonometry and Applied Mechanics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*(Algebra applied to experimental results.)*			—	—	—	20	20	20	40	40	40	40	40	40	300
																							Total Humanist Lessons.....									4,770
	Nature Subjects.																															
15	Geography	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	20	—	—	—	—	—	—	—	—	—	720
16	Geology	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	20	20	10	10	10	10	10	10	420
17	Botany*	10	10	10	10	10	10	10	10	10	10	10	10	—	—	—	—	—	—	—	—	—	*(Physical Geography applied.)*									120
18	Biology	—	—	—	—	—	—	—	—	—	—	—	—	10*	10*	10*	10*	10*	10*	10*	10*	10*	—	—	—	—	—	—	—	—	—	120
19	Physics	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	30	30	30	30	30	30	10	10	10	10	10	10	20	20	20	210
20	Chemistry	—	—	—	—	—	—	—	—	—	—	—	—	30	30	30	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	870
21	Hygiene	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	20	20	20	20	20	30	30	30	420
22	Economics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	10	10	10	10	10	10	10	10	90
																							10	10	10	10	10	10	10	10	10	90
																							Total Lessons—"Nature Subjects"									2,490
	Manual Expression.																															
23	Writing*	Half an hour daily for such as need it.												* Alternative to Workshop, or extra.																		
24	Workshop	20*	20*	20*	20*	20*	20*	20*	20*	20*	20*	20*	20*	30*	30*	30*	30*	30*	30*	30	30	30	20	20	20	20	20	20	20	20	20	690
25	Drawing	40	40	40	40	40	40	40	40	40	40	40	40	30	30	30	30	30	30	30	30	30	?(20	20	20	20	20	20	20	20	20)	930
26	Music*	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	?(30	30	30	20	20	20	20	20	20)	1,470
27	Reading*	Children to read aloud in evenings three times a week.																														
																							Total Handwork and Music Lessons...									3,090
28	Religious Instruction* ...	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	26	26	26	26	26	26	26	26	26	
	Lessons per term (10 weeks).	320	320	320	320	320	320	320	320	320	360	360	360	360	360	360	360	360	360	360	360	360	400	400	400	420	420	420	420	420	420	
		Total time 4 hours per day on average of 6 days.												Total about 5 hours a day per week of 6 days.									Total 7—8 hours a day per week of 6 days.									

PROVISIONAL

Analysis.

First Period, 8—12.

Humanities	1,740
Mathematics	1,020
Nature Subjects ...	840
Handwork	720
Music	720
Total ...	5,040

Second Period, 12—15.

Humanities	1,440
Mathematics	780
Nature Subjects ...	750
Handwork	540
Music	540
Total ...	4,050

Third Period, 15—18.

Humanities	1,590
Mathematics	930
Nature Subjects ...	900
Handwork ?	360
Music ?	210
Total ...	3,990

Totals by Branches.

Humanities	4,770
Mathematics	2,730
Nature Subjects ...	2,490
Handwork	1,620
Music	1,470
Total ...	13,080

Totals by Periods.

1st Period: Lessons three-quarter hour	5,040
2nd Period: Lessons partly one hour each	4,050
3rd Period: Lessons mostly one hour each	3,990
Total ...	13,080

32 lessons of ¾ hour each per week of 6 days

$$\frac{32 \times 3}{6 \times 4} = 4 \text{ hours per day,}$$

exclusive of Workshop and Music, and Botany, which is not a matter of set instruction.

To face p. 230.

and equipollency in alternative "subjects," is already largely in force, and only needs some additional extension.

Such schemes would not need enforcement, for which of course there is no adequate authority in England. Their general adoption would be assured by an official notification that the public examinations would, after a given date, be conducted in accordance with them, and each school would then be at liberty to attain the required standard by its own methods. The examinations, in fact, supply a ready means of bringing in a systematic instruction, and thus relieving over-pressure without lowering the standard. Insistance on the test of the early stages of knowledge would compel thoroughness in the early instruction, for the power of applying principles cannot be crammed. Such courses might embody any well thought out means of attaining the desired end, and might express the most extreme classical equally well with enthusiastically "modern side" opinions; but they must be systematic, following by definite steps, from a definite initial stock of ideas, to a definite end of practical or literary use. When this has been done, we venture to assert that the vexed question of Latin or no Latin will solve itself, and that the real reason for the long retention of Latin on an overloaded curriculum will be found to have been neither the refining influence of the "Metamorphoses" (setting aside the *Ars Amoris*), nor the literary grace of Horace, nor even the "unparalleled mental exercises" of the Latin Grammar, but simply and solely that in the latter half of the XIXth. century Latin and Greek were the only branches of instruction which had been thoroughly systematized. Let the English instruction be equally systematized. What ideas are incommunicable by Shakespeare's tongue? What "form" is so refined in Latin that schoolboys cannot appreciate it in English? Do Humane letters consist in evoking sympathy with that which is noble in man, or not? And if so, does any sane man seriously maintain that English is an unsuitable medium for awakening it?

Let the scholarly boys who have shown marked intellectual readiness in their early years, or whose family connections promise openings beyond the University, join the classical side by all means; and there let them acquire, not merely fair readiness with "unseen" translation, but that familiarity with the Latin and Greek languages which would lead to that intimate acquaintance with the mythology, art, and thought of Greece, and the power, genius, and government of Rome, as expressed by the great works of either nation, which was the old conception of "the Humanities."

On the Modern side, familiarity in the use of the mother tongue in speaking and writing, and with that best and most copious of all modern literatures, which is our noble birthright, might well aid us to as high a sense of rational patriotism as a parallel course of education aided the Athenian. Leisure could then be found for closer acquaintance with the literatures and histories of our two greatest neighbours, to enlarge that patriotism by recognising the claims of others on our esteem, enabling us to perceive that it is not by the dominance of any one type—not even the Anglo-Saxon—over the rest of the All-Father's children that the kingdom of God can be established, but by the development, in mutual respect of rights and feelings, of all the types in which the World-Soul is revealed on this planet, and by the turning to the amelioration of that common life so hardly lived in every civilized country, the vast forces that man has discovered and is yearly discovering.

The courses of the first four years would be common to most of such Schemes of Instruction, so that a boy might, at twelve years complete, pass to one or other without having to cast aside any portion of his bygone work. They might be made common in all cases if University students could be permitted to graduate in modern languages and literatures alternatively to those of the ancients. And

such courses involve one much-needed reform which has not yet been touched upon. Nothing, except the habit of pressing formal teaching on minds unacquainted with the real elements, makes for want of system and scrappy work more than the habits of entering boys at any age, and at any time of year,* and then pushing promising ones up through a school by removes each term. This necessarily destroys systematic instruction. Each "form" should mean a year's work, as it does in the successful schools of Scotland and Germany. The case of the exceptionally clever boy is met by giving him fuller and completer application and developments of his form work.

5. Conclusion. This is the remedy which we have to lay before the public and the profession for the educational overstrain now on all hands admitted. It renders possible, we submit, the realization of three demands often considered mutually exclusive: the demand of parents and of head-masters for a lighter curriculum; the growing demand of the public for more scientific knowledge; and the demand of professional bodies for a higher general standard and sounder training. It is, we venture to claim, Nature's remedy; for it aims neither at "stocking" the mind with a set of ideas ready-made according to some private pattern, nor at "moulding" it according to some theological formula, but at disciplining it according to its own laws, at supplying it with suitable food and a suitable environment in which it may grow naturally, according to its own innate powers, by sound habits of body and mind, which habits are the only real preparation for that right action in fresh and unfore-

* This is also one of the chief reasons for the expensiveness of many Middle Class Schools. Nothing can be done systematically with boys who are at all sorts of stages and degrees of progress. Could forms be filled at the beginning of each school year, it would be possible, in many cases, to reduce fees nearly 50 per cent. But so entirely are individual parents occupied with their own boys only, that this fact does not strike them.

seen circumstances which is the essence of sound character. The formation of sound intellectual habits is its end, and the living interest in the works of the men of the past and of the men of to-day are its means.

Complaints are heard on all sides of the total unfitness of so-called "educated" boys for the various positions they are called upon to fill on leaving school. Merchants have told us that one aspect of public school life, and the habits of mind engendered, unfits a boy for taking his father's place in any business where a certain amount of special technical directive ability is a *sine quâ non*. A father does not mind this in the case of the brilliant boy who makes himself a name, and justifies the boast of the Public Schools that they turn out "scholars and gentlemen"; but he does feel aggrieved when his boy of good but quite average abilities leaves school with marked preference and capacity for nothing in particular except cricket and football, a delight in spending money, and a contempt for all the means by which it is earned.

Nothing is said against the character which is developed in our English schools. A character of truthful, honest self-reliance is their best product, and one which is envied nowhere more than in Germany. It remains for England's sake to add to it that sound knowledge by which the greatness and prosperity of her children can be indefinitely extended without injury to neighbours; increasing and strengthening that great body of public opinion which claims free trade and free seas, and equality of opportunity for all, and is prepared to support this policy with the armed hand as well as with the advised head.

The "Fight for the Schools" by any party is based on the mistake that instruction is didacticism—the inculcation of ready-made opinions. For these a sure Nemesis lies in wait, precisely because no "system" is, or can be, final. It is possible, as many have claimed, so to mould the child up to twelve years old that the form so artificially given shall

be permanent, and that its limitations shall endure for life; but history shows us that the result of so doing is to perpetuate antagonisms in a world of diverse functions, and therefore of diverse minds, and wherein healthy evolution, understanding, sympathy, and charity, are means leading us forward into the unknown,—means which, so far as our lives on earth are concerned, are ends in themselves.

Testimony comes from all sides to the error of forcing a particular set of ideals upon children whose natural proclivities are strongly set in another direction. In the East we have for years insisted on an English liberal education, in which the chief element is the literature of Western Europe, with what result?—That the native official acquires his literary facility at the expense of character and fitness for authority and responsibility. It has now been found necessary—significant fact—to open schools and colleges for boys of good families whose record of services and social position might naturally expect places in the public service, where such boys may be trained, through the medium of their own language and literature, and the Natural Sciences (which, as vitally true, are common to all men), to fitness for the practical work of administration. The present small and tentative efforts show that it is at last recognised that native character is rooted in native society, native religion, and native ideals. The educational products of Western civilization, which we force upon the native, we are assured, have "little effect beyond making the pupil write English fluently, and of unsettling his whole character." The same argument holds good to a very great extent at home.

Health, enterprise, and the discernment of worthy from unworthy ambitions, will conduct any society to prosperity, whether "individualist" Anglo-Saxon or "socialist" Celt, provided that the mind be instructed in the means whereby the aims of the will may be wholesomely and lawfully carried out. The really great and successful men of the

world, Huxley has told us, are those who take Honours in Nature's University, and learn the laws—physical, mental, and moral—which govern men and things, and having learned them, obey them; for in these men, strong nerved, clear minded and honest hearted, is realized that knowledge of principles and that obedience to law whereby comes mastery over all the raw material of character and life,—that DIRECTIVE ABILITY which it is the purpose of all training to bestow.

THE END.



GEORGE PHILIP AND SON, PRINTERS, LONDON AND LIVERPOOL.

32 FLEET STREET, E.C.,
September, 1899.

GEORGE PHILIP & SON'S LIST

OF STANDARD WORKS ON

Manual Training, Physical Exercises and Kindergarten Training, etc.

MANUAL TRAINING, SLOYD, WOODWORK, etc.

The Authorised Translations of the Sloyd Handbooks used at Näas, in Sweden, and published under the auspices of "The Sloyd Association of Great Britain and Ireland."

	s.	d.
1. THE TEACHER'S HANDBOOK OF SLOYD. Containing Explanations and Details of each Exercise. Adapted for English Teachers by MARY R. WALKER and WILLIAM NELSON. With over 130 Illustrations and Plates. Second edition, revised and enlarged. Demy 8vo, 270 pages, cloth	6	0
2. PRACTICAL DIRECTIONS FOR MAKING THE HIGH SCHOOL SERIES OF SLOYD MODELS. For the use of Teachers and Private Students. Translated and adapted for English Teachers. With a Series of Alternative Models. By MARY R. WALKER and WILLIAM NELSON. Crown 8vo, interleaved, cloth	2	0
3. WORKING DIAGRAMS OF HIGH SCHOOL SERIES OF SLOYD MODELS. Drawn to English Measurements. By WILLIAM NELSON. The Set consists of fifty Models, together with five additional Diagrams. Printed on Cards, size 11½ in. by 7¾ in. In stout wrapper, with elastic band	3	0
3A. WORKING DIAGRAMS OF THE ENGLISH SERIES OF SLOYD MODELS. Drawn to Metric Measurements. By WILLIAM NELSON and PHILIP COLE. Printed on Cards, size 15 in. by 10 in. In stout wrapper, with elastic band nett	3	6
4. THE THEORY OF EDUCATIONAL SLOYD. Revised and edited for English and American Students by an INSPECTOR OF SCHOOLS. Together with a *résumé* of the History of Manual Training, and a Portrait and Biography of Herr Salomon. Second edition, crown 8vo, 164 pages, cloth	3	6
A PLEA FOR SLOYD. By J. FRANZEN. Translated from the Swedish by ANNA STRÖMSEN, Victoria College, Belfast. F'eap 8vo, paper cover	0	9
WOODWORK COURSE FOR BOYS. Consisting of a graduated series of 30 Models, arranged so as to cover the requirements of the Science and Art Department, South Kensington. Containing full-page Working Drawings, and practical Directions for making each Model. By WILLIAM NELSON. Imperial 8vo, boards	3	6
EXERCISES IN WOODWORKING. By H. S. HELE SHAW, LL.D., and R. GARNER. Series I.—**Joinery.** 24 sheets in paper wrapper, nett	2	0
MANUAL INSTRUCTION.—WOODWORK. First, Second, and Third Years' Courses. A handbook for School Boards, Technical Instruction Committees, Organisers, and Teachers of Manual Instruction Classes, and Students. By J. CHARLES PEARSON, Director of Manual Instruction to the Liverpool School Board. A series of 42 royal folio Plates. Oblong folio, cloth extra... nett	7	6
LESSONS IN WOODWORK FOR EVENING CLASSES. Comprising Exercises in the Principles of Joinery, and Studies and Designs for Wood Carving. A series of 20 Plates, with accompanying letter-press prepared under the direction of the Hampshire County Council. Foolscap folio, stiff boards	3	6

MANUAL TRAINING, etc.—continued.

THE SIMPLEX SERIES OF ELEMENTARY WOOD CARVING DESIGNS. By MARY J. JOHNSON, Certificated Teacher (1st Class), School of Wood-Carving, South Kensington. Six Simple Designs in wrapper... price, nett 2 6
Separate Design each, nett 0 6

PHYSICAL EXERCISES.

NEW SERIES OF GYMNASTIC HANDBOOKS. By A. ALEXANDER, F.R.G.S., late Director of the Liverpool Gymnasium; Hon. Sec. of the National Physical Recreation Society.

1. **Musical Drill for Infants.** Fifth Edition, enlarged. With over 100 Illustrations, and specially adapted Music. 92 pages. Crown 8vo, cloth
2. **Musical Drill—Part II.** For use in Schools and Calisthenic Classes. Fully Illustrated, and with Musical Accompaniments by LESLIE HARRIS. 132 pages. Demy 8vo 3 6
3. **Healthful Exercises for Girls.** Fourth Edition, enlarged. With over 200 Illustrations, and Musical Accompaniments arranged by LESLIE HARRIS. Crown 8vo, cloth 2 6
4. **Modern Gymnastic Exercises**—Part I. (Elementary). Third Edition. With over 200 Illustrations, and Musical Accompaniments. 140 pages. Crown 8vo, cloth 2 6
5. **Modern Gymnastic Exercises**—Part II. (Advanced). Second Edition. With 270 Illustrations. 220 pages. Demy 8vo, cloth . 3 6
6. **Physical Drill of all Nations.** With numerous Illustrations, and National Music specially adapted to the Exercises by LESLIE HARRIS. Demy 8vo, cloth 3 6
7. **Drill for the Standards.** Containing a varied selection of Physical Exercises. Adapted for use in Elementary Schools, as required by the New Code. Containing 216 Illustrations, and specially adapted Musical Accompaniments. Crown 8vo, cloth 2 6
8. **New Games and Sports for Schools**, Clubs, and Gymnasia, with and without Apparatus. Illustrated. Demy 8vo, cloth 3 6

The other Drills in this Series are as follows, all with Illustrations and Musical Accompaniments :—

(*a*) **Military Gun Drill.** Specially suited for Boys nett 0 6
(*b*) **Scarf Drill.** A most attractive and graceful Drill for Girls and Infants nett 1 0
(*c*) **Maypole Exercises** and Dance. For indoor or outdoor use. With Musical Accompaniments. For Boys, Girls, or Infants, nett 1 0
(*d*) **Flag Exercises.** For Boys and Girls. By EDWARD ALEXANDER, Director of Physical Training, Liverpool College, etc. Containing Twelve Distinct Exercises, with "Formation" and "March Off" Movements, all having appropriate Music. Crown 4to (size 10 by 7½ in.), limp cloth nett 1 6
(*e*) **Grecian Exercises.** With Cymbals. For Boys and Girls nett 1 0
(*f*) **Hoop Exercises.** Just Published. An English Musical Drill. With Musical Accompaniments. Crown 4to (size 10 by 7½ in.), limp cloth nett 1 6

GYMNASTIC EXERCISE WITHOUT APPARATUS, according to Ling's Swedish System for the due development and strengthening of the Human Body, by Dr. MATHIAS ROTH. With Illustrations. Demy 8vo, cloth 1 0

BANDAGE DRILL. With Music. From Five Years of Age. By Mrs. FRANCES STEINTHAL. Demy 8vo, paper 1 0

A complete Price List of "Calisthenic and Musical Drill Apparatus" will be sent, post free, on application to the publishers in London or Liverpool.

PHILIPS' SYSTEMATIC COURSE OF ELEMENTARY DRAWING AND COLOURING in the Kindergarten, School, and Home.

THE "VICTORIA" SERIES OF COLOURED CARDS. By Mrs. J. J. FINDLAY, formerly Kindergarten Mistress at the Sheffield High School, and now one of the Examiners to the National Froebel Union. Consisting of 48 Coloured Plates containing over 100 Original Exercises and Designs, carefully graded and arranged for Children between 4 and 8 years of age, in 6 Packets, each containing 8 Plates, accompanied by full Instructions, suitable Stories, Action Songs, and Kindergarten Games, price, per packet, nett 0 6
The Complete Series of 6 Packets nett 3 0

THE "ALEXANDRA" SERIES OF COLOURED CARDS. By E. ARCHIBALD BROWN, Master of Drawing and Painting at the National Art Training Schools, South Kensington, and Drawing Master to the Royal College of Science. Consisting of 32 Coloured Plates containing over 80 Original Exercises and Designs, carefully graded and arranged for Children between 6 and 10 years of age, in 4 Packets, each containing 8 Plates, accompanied by Rules and Instructions price, per packet, nett 0 6
The Complete Series of 4 Packets nett 2 0

OUTLINE DRAWING BOOKS. A unique feature of this Course, and one which it is hoped will very greatly increase its utility, is the Series of Outline Books, one to accompany each of the Packets of Cards in the two Series.
1. The "VICTORIA" SERIES of Outline Drawing Books, 6 Books, Nos. 1-6, each 0 1
2. The "ALEXANDRA" SERIES of Outline Drawing Books, 4 Books, Nos. A-D ,, 0 1

BLANK CHEQUER DRAWING BOOKS. Each Book contains 32 pp., price 0 1
1. ½-inch Chequers to accompany "VICTORIA" SERIES, Nos. 1, 2, and 3.
2. ⅝-inch Chequers to accompany "VICTORIA" SERIES, Nos. 4, 5, and 6.
3. ¼-inch Chequers to accompany "ALEXANDRA" SERIES, Nos. A, B, C, & D.

PHILIPS' "EXCELSIOR" COLOURED CRAYONS. Specially prepared and assorted for "Philips' Systematic Course of Elementary Drawing and Colouring" price, per box, nett 0 1
1. Seven Solid Crayons (red, blue, yellow, purple, green, orange, and brown), in beautifully enamelled metal box.
2. Eight Solid Crayons (red, blue, yellow, purple, green, orange, brown, and black), in neatly printed strong cardboard box.

Detailed Prospectus, with Specimens of Coloured Cards and Outline Books, gratis on application.

PHILIPS' ARTISTIC SERIES OF STUDIES FOR BRUSHWORK, CRAYON DRAWING, AND BLACKBOARD DRAWING.

BRUSHWORK STUDIES OF FLOWERS, FRUIT, AND ANIMALS, for Teachers and Advanced Students. Consisting of 27 Plates, beautifully printed in Colours, accompanied by full Directions and Practical Hints. In artistic cloth cover, oblong 4to price, nett 6 0

For use in connection with the above.

AN INTRODUCTORY COURSE OF BRUSHWORK. With an Introduction by T. R. ABLETT, Hon. Director and Secretary of the Royal Drawing Society of Great Britain and Ireland. A Series of 25 beautifully Coloured Plates, in artistic cover, oblong 4to price, nett 5 0

PHILIPS' BRUSHWORK COPY BOOKS. By ELIZABETH C. YEATS, Author of "Brushwork" and "Brushwork Studies in Flowers, Fruit, and Animals." In 3 Parts. Oblong 4to price, each 0 3
The 3 Parts bound together in stiff cover price, nett 1 0

PHILIPS' ARTISTIC FRUIT STUDIES. Twelve Original Designs for Brushwork, Drawing in Coloured Chalks, and Embroidery. By R. H. WRIGHT.
COLOURED SERIES, beautifully reproduced, for Teachers' use, in artistic paper wrapper 1 3
OUTLINE SERIES, printed on stout Cartridge paper, for Class use. Packet of Twelve Assorted Designs 0 3
Packet of Twenty-five of a Single Design 0 6

PHILIPS' ARTISTIC ANIMAL STUDIES. Twelve Original Designs for Brushwork, Drawing in Coloured Chalks, and Embroidery. By H. A. K. DIXON.
COLOURED SERIES, beautifully reproduced, for Teachers' use, in artistic paper wrapper 1 3
OUTLINE SERIES, printed on stout Cartridge paper, for Class use. Packet of Twelve Assorted Designs 0 3
Packet of Twenty-five of a Single Design 0 6

BRUSHWORK, etc.—continued.

BLACKBOARD DRAWING STUDIES. With Hints and Directions by KATHARINE PHILLIPS, Superintendent of Method in Infants' Schools for the School Board of London. Illustrated by HELEN PHILLIPS, Exhibitor Royal Academy, Paris Salon, etc. This Series of Studies consists of 24 Designs, boldly printed in silver line, on sheets of Blackboard Paper. Size 22 by 14½ inches. Packed in a strong cardboard box price, nett 6 0

KINDERGARTEN TRAINING.

THE PARADISE OF CHILDHOOD. Quarter Century Edition. A Practical Guide to Kindergarteners, by EDWARD WIEBE. Edited by MILTON BRADLEY, including a Life of Froebel by HENRY W. BLAKE. Profusely Illustrated, demy 4to, 274 pages, handsomely bound in cloth price, nett 7 6

KINDERGARTEN PRACTICE. Translated and abridged from Koehler's "Praxis des Kindergartens," by MARY GURNEY. Published under the sanction of the Froebel Society.

Part I.—Froebel's First Gifts. Sixth Edition. Crown 4to, cloth .. 1 6

Part II.—Froebel's Plane Surfaces. Gifts VII., VIII., IX., X. Third Edition. Crown 4to, cloth 1 6

KRAUS.—THE KINDERGARTEN GUIDE. By MARIA KRAUS-BOELTE and JOHN KRAUS. In Ten Volumes. F'cap 4to, cloth, in Nine Volumes. A most comprehensive work :—

Nos. 1 and 2—Gifts I. to VI. 144 pages, 547 Illustrations 4 6
No. 3—Tablet-Laying. 94 pages, 553 Illustrations 3 0
No. 4—The Connected Slat (or Jointed Lath), Slat-Interlacing (or Plaiting-Sticks), Stick-Laying. 134 pages, 309 Illustrations 3 6
No. 5—Ring-Laying, Thread-Laying, Points. 82 pages, 468 Illustrations .. 3 0
No. 6—Perforating and Sewing. 77 pages, 201 Illustrations 3 0
No. 7—Drawing and Painting. 97 pages, 351 Illustrations, and 12 Plates, containing 83 Coloured Designs 5 0
No. 8—Paper-Interlacing (or Twisting), Mat-Weaving (or Plaiting). 77 pages, 225 Illustrations 3 0
No. 9—Paper-Folding and Paper-Cutting, 92 pages, 444 Illustrations 3 6
No. 10—Pea-Work, Cardboard-Modelling, Clay-Modelling. 76 pages, 300 Illustrations 3 0

THE MOTHER'S THREE FRIENDS and their Influence on the Nursery and Home. By MRS. CHARLES E. GREEN, M.C.P., Member of the Council of the Froebel Society. With 58 Illustrations by KATE E. GREEN. Crown 8vo 3 6

EXPLANATION OF THE KINDERGARTEN SYSTEM OF EDUCATION, considered in its various aspects. By KARL FROEBEL. Boards 0 6

IN THE CHILD'S WORLD. By EMILIE POULSSON. This is a book for Mothers, Kindergarteners, and Primary Teachers, and every one interested in little children. It is a library in itself, an epitome of childhood literature. There are 443 delightful pages, full of Illustrations, Rhymes, Talks, and Stories. Price, in art linen binding nett 7 6

MORAL TRAINING. Froebel and Herbert Spencer. By MISS SHIRREFF. Paper cover nett 0 6

THE CIRCULAR TABLET. A Connecting Link in Froebel's Series of Gifts. By E. E. LAWRENCE. Published for the Council of the Froebel Society. With 21 full-page Plates. Demy 4to, boards 2 6

THE PRINCIPLES AND PRACTICAL WORKING OF THE NEW EDUCATION. A few Suggestions to Parents, by the LADY ISABEL MARGESSON. Paper cover nett 0 6

A HANDBOOK TO THE STUDY OF NATURAL HISTORY. For the use of Beginners. With an Introduction by SIR MOUNTSTUART E. GRANT-DUFF, G.C.S.I., F.R.S. Edited by the LADY ISABEL MARGESSON. Contains a Series of popular Articles on various branches of Natural History by well-known Authors. Crown 8vo, cloth 3 6

CHILD LIFE. A new Magazine for Kindergarten Teachers, Parents, and all who are interested in the education and development of young children. Issued Quarterly. For a single number price 1 0
Or Yearly Subscription, post free 4 0